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ABSTRACT

This report and its appendices are the results of a study of recruitment and retention "problems" in the various engineering technology programs offered by the community colleges of the State University of New York (SUNY). The focus of the report and all but one of the appendices is upon the recruitment problem. There are five sections in the report proper. Section one provides a brief description of the methodology employed by the research group of the Educational Policy Research Center. The second section examines some conditions under which recruitment might be perceived to be a "problem" that requires policy action. In the third section, an analysis is made of the factors that influence individual decisions to enroll or not to enroll in engineering technology programs, their relative weight, and their tractability. Section four describes some of the recruitment procedures that have been found to be effective. The fifth section contains the recommendations of the Educational Policy Research Center. The six appendices to the report are: A Forecast of Future Need for Technicians; Analysis of SUNY Enrollments by Type of College 1968-71; A Review of Factors Affecting Recruitment into Post-Secondary Technical Education; Recruiting Techniques; Intervention Strategies for Increasing Enrollments in Community College Technical Programs; and The Attrition "Problem" in the Community College. (DB)

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FACTORS AFFECTING ENROLLMENT IN ENGINEERING-RELATED TECHNICAL PROGRAMS IN COMMUNITY COLLEGES

by

Thomas B. Corcoran
and
Ross Burke

FINAL REPORT

Prepared for the Bureau of Occupational Educational
Research of the New York State Department of Education

February 1973

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Educational Policy Research Center
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The research for this paper was conducted pursuant to Contract No. C 53173 with the Bureau of Occupational Educational Research, New York State Department of Education. Contractors undertaking such projects under Government sponsorship are encouraged to express freely their professional judgment in the conduct of the project. Points of view or opinions stated do not, therefore, necessarily represent official Department of Education position or policy.

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INTRODUCTION

In early 1972, the Educational Policy Research Center at Syracuse undertook a study of recruitment and retention "problems" in the various engineering technology programs offered by the community college of the State University of New York (SUNY). The study was conducted on behalf of the New York State Bureau of Occupational Education. This report and its supporting appendices are the results of that study.

A decision was taken early in the project to focus primarily upon the problems of recruitment rather than upon the retention (or attrition) problem.[1] There were several reasons for this decision. First, existing data on rates of attrition in technical and other community college programs are so crude that it is not possible to ascertain if there are systematic differences among the colleges or across programs within a college. Thus, the apparently high attrition rates may be generic to the community college (and other 'open admission' institutions) rather than being a function of any specific program and its characteristics.

Second, existing research on retention programs sheds little light on effective procedures for reducing attrition. There is considerable rhetoric and exhortation about counseling techniques, remedial work, tutorials, cooperative education, etc., but the evidence is thin and inconclusive as to the effects of these efforts on program completion rates. Even the widely acclaimed NORCAL study of attrition-reducing procedures in twenty-two community colleges in Northern California appears to be inconclusive upon close examination.

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[1] See Appendix F, "The Attrition Problem in the Community College" for a discussion of the issue surrounding student retention.

Certainly it does not provide a basis for making policy recommendations, although it suggests some interesting directions for experimentation. The only conclusion to be drawn from the research on the "attrition problem" is that almost any form of individual attention or special treatment will reduce attrition if it does not carry with it the stigma of expected failure. Thus some southern colleges have found that retention rates improved when the term "remedial" was dropped from course titles.

The final reason for the shift of focus arose out of the increasing conviction on the part of the project staff that vigorous, informative and honest recruitment efforts would do more to relieve the attrition problem than anything else. Attrition often seems to be associated with a low level of commitment by students to their curricular choices, misunderstandings about the occupational opportunities associated with a program, the opportunities for transfer to a baccalaureate program, and the academic demands made by the program. These problems are probably endemic to open admissions institutions but they can be alleviated by influencing the bases upon which curricular choices are made by students upon admission. And this is a recruitment problem.

The argument that attrition rates can be reduced by more honest and more intensive recruitment procedures may apply particularly to engineering technology programs. All of the factors mentioned above as contributing to attrition seem to be present in these programs. Engineering technology programs demand considerable vocational commitment on the part of students due to their narrow curricular orientation. They frequently require intensive work in math and science, e.g., they are not "gut" programs. Moreover, potential students are less likely to have first-hand familiarity with the occupational roles open to graduates of these programs than they are of programs in health, education, or business. Finally, until recently, transfer from AAS programs to baccalaureate programs was difficult.

However, improved and expanded recruitment programs do not guarantee higher enrollments. On the contrary, such efforts could lead to reductions in enrollments. In narrowly vocational fields like engineering (and probably engineering technology), the fraction of students who enter the field fluctuates cyclically.[2] Engineers and engineering technicians are frequently employed in the durable goods industry, construction, and military research and development. These industry groups are especially affected by economic fluctuations. Enrollment in engineering programs is remarkably sensitive to these changes in the job market for engineers. When the demand is high, salaries rise and enrollments go up. Large graduating classes depress salaries and lead to a relative decline in enrollments. Small classes have the reverse effect. Depending upon the behavior of demand for engineers, enrollments eventually rise again and the cycle repeats itself. Unlike fields dominated by unions or professional associations, the number of students graduating in engineering is a function of price or wage differentials.[3] In such a case, better occupational information made available to potential students may exacerbate the cyclical patterns.

Such fluctuations are unsettling to educational planners and policymakers and undoubtedly disturb institutional arrangements. Nevertheless, an underlying assumption of this report is that student choices should be respected. Free choice within the parameters set by merit criteria and reasonable public subsidy is essential to the ideology of equal opportunity. Thus we reject a manpower approach to policy formation in higher education because it is rigid, unwieldy, and unnecessary. Students are more responsive to changes in the labor market (given adequate information) than institutions are. Thus the goal of planning must be to create flexible, responsive institutions rather than to predetermine quotas for fields of study.

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[2] Engineering technology includes chemical, civil, electrical, electronic, industrial, and mechanical technology curricula. As it is understood in this report, it does not include engineering science programs, computer programming, drafting or other related curricula.

[3] Freeman, R. B. The Market for College-Trained Manpower: A Study in the Economics of Career Choice. Cambridge, Mass.: Harvard University Press, 1971.

Given this position, recruitment procedures take on new meaning. It is no longer just a matter of filling places (although this will always be a concern) but a matter of adequate information reaching appropriate markets. And if our earlier arguments that retention is influenced by recruitment procedures carry any weight, recruitment or marketing becomes the central policy problem of the community college. Note however that this notion of a recruitment problem differs considerably from concerns arising solely from observations of declining enrollments or unfilled "places."

Therefore, this report and all but one of its supporting appendices focus upon the recruitment problem. The report itself is more than a summary of the supporting papers as it draws upon research materials and field work not summarized in the appendices. There is a difficult trade-off between comprehensibility and comprehensiveness in a report of this nature. In this case, the intent has been to emphasize the former and therefore some of the data examined in the course of the project is not reviewed in detail either in the report or the appendices.

The report itself is organized into five sections. Section one is a brief description of the methodology employed by the research group at EPRC. The second section examines some conditions under which recruitment might be perceived to be a 'problem' requiring policy action. The presence or absence of the critical condition, a need for the skills in the market place, is examined in detail in Appendix A and these arguments are summarized in the report. The third section is an anlysis of the factors that influence individual decisions to enroll or not to enroll in engineering technology programs, their relative weight, and their tractability. The intent is to provide a comprehensive framework for policy discussions about recruitment at the institutional level and to let the evidence presented guide rather than determine these discussions. The next section describes some of the recruitment procedures found to be effective elsewhere. The concluding section contains the recommendations of the Educational Policy Research Center. These recommendations include suggestions for action by the New York State Education Department, individual colleges and technical departments as well as an agenda for further research to bring greater clarity and understanding to the larger problem of enhancing the attractiveness of occupational curricula vis-a-vis general or liberal education.

It is not the intent of this document to provide universally useful solutions to the recruitment problems of engineering technology programs. Instead, its intent is to serve as a heuristic device, in the best sense of that oft misused term. The hope of the authors is that the arguments and evidence presented and the recommendations offered will provoke discussion and that the conceptual framework provided will aid that discussion. If such discussions occur at the college or department level, they may well arrive at conclusions different from those presented below. Conclusions designed to fit the case of any community college would by necessity have to be so general as to risk being trivial. Finally, many readers will react with protestations that many of the recommendations are already being implemented by their institutions. It would be surprising if this were not the case. However, they may not be the *modus operandi* in another college. And even those enlightened administrators who have foreseen all of our conclusions may benefit from thinking them through again.

I.

METHODOLOGY

Policy research differs from academic research in several ways. First, it must face severe constraints of time. Second, it must be phrased in the language of the practitioner or the client, rather than the often esoteric language of the academician. Third, it usually depends upon available sources of information and therefore typically lacks the elegance of academic research. The policy researcher is necessarily eclectic in his pursuit of data and draws equally upon existing research, the re-analysis of available data, the experience of knowledgeable individuals, and his own impressions and observations of the policy context.

Finally, the intent is to inform and guide policy rather than to make a contribution to a discipline or a theory. This significantly alters the rules of evidence. Partial information must always suffice. External factors cannot be held constant in the analysis because they will not be constant in the policy milieu. Qualitative factors that cannot be built into a sophisticated multivariate design must be given consideration. And so on. The methodology of policy research is closer to that of medical diagnosis than it is to the idealized model of the social scientist. The policy researcher has to recognize relevant evidence and understand its implications but he also must know the limits of his craft and he must not ignore his intuition. Nor can he afford to discount possibilities because they conflict with his world view. On the contrary, it is the world view(s) of the client(s) that forms the relevant framework for making recommendations.

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This project was, like all such efforts, an imperfect attempt to combine reviews of existing research, data from field notes, opinions of 'experts' and insights gained by the staff involved in the project. Some of the literature reviewed during the project is summarized in the appendices but the papers included therein are merely representative of work done by the staff. Time, resources, and concern about the bulk of the document led us to exclude other equally valuable materials prepared during the course of the research.

Early in the project an ERIC search was conducted and leading individuals in the field of community college research were contacted to identify relevant literature. Two papers were then contracted out to consultants to cover specific aspects of the recruitment issue. Other pieces of work were undertaken by members of the EPRC staff. All of the papers prepared by consultants and some of the staff work are contained in the appendices.

Additional data was collected through interviews with faculty, students and administrators at Mohawk Valley Community College, Onondaga Community College, Monroe Community College and Broome Community College. Further interviews were conducted with personnel people at General Electric, Monsanto Chemical, Carrier Corporation and American Telephone and Telegraph.

Basic data on manpower projections, enrollments and graduates was gathered from publications of the U.S. Department of Labor, the Department of Health, Education and Welfare and the Office of Institutional Research in SUNY.

The mass of information thus collected by the project staff was then analyzed via a process usually ennobled by academics as 'model construction,' but more accurately understood as the construction of a mosaic. The result, we hope, is a useful framework for policy discussion and debate and a set of recommendations that rest upon sound arguments and admittedly partial evidence.

Some caveats are in order. Some extremely important kinds of data proved to be unattainable--at least in usable form. Basic information on characteristics of students by program was not available and national data had to be used as a surrogate. Data on student attitudes toward technical programs and various occupations was obtained in a similar manner. There is only limited information available on the actual career experience and income experience of technical graduates on a state or national level. This is a significant knowledge gap that limits the analysis. Finally, the characteristics of community college programs and labor market conditions vary significantly across the state and do not lend themselves to easy generalizations.

II.

DEFINITION OF THE PROBLEM

Enrollments in the engineering technology programs offered by the community colleges in the SUNY system have fluctuated considerably during the past decade. Although total statewide enrollment in the technology fields has increased, the growth rate for specific programs has been uneven. For example, the data in Table I show a 30% decline in statewide enrollment in chemical technology programs since 1968.[4] Mechanical and civil technology programs have been stable or stagnant (depending upon the interpretation given to the data) and only electrical, electronic, and industrial technology programs have experienced significant growth in enrollments during the past four years.

A more severe situation exists at the national level. The Engineering Manpower Commission of the Engineers Joint Council recently reported that an analysis of enrollment data for 1970, 1971 and 1972 revealed a 4% decline in enrollment in two-year technology programs.[5] While this survey is not fully reliable because of problems in the reporting procedure that was used, the conclusions are supported by preliminary data collected by the U.S. Office of Education and by the Bureau of Labor Statistics.[6] This leveling off follows a period in which technology programs were rapidly expanded.

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[4] See Appendix B for a more complete treatment of recent enrollment trends in engineering technology and related fields.

[5] Engineering and Technical Enrollments - Fall 1972. New York: Engineers Joint Council, 1973.

[6] The conclusions were confirmed via personal communications with staff in the two agencies.

Table 1

Enrollments in Two-Year Community College Technical Programs, New York State

Area	Fall, 1968	Fall, 1969	Fall, 1970	Fall, 1971
Chemical Technology	666	610	479	474
Civil Engineering	1,057	1,075	1,039	1,115
Electrical and Electronic Engineering*	2,690	2,972	3,043	3,512
Industrial Engineering and Technology	252	294	347	535
Mechanical Engineering and Technology	2,336	2,284	2,196	2,314

SOURCE: Enrollment by Academic Programs, Fall, 1968 through 1971. Report No. 33, Office of Institutional Research, SUNY, Albany, 1972.

*Figures exclude Queensboro Community College due to irregular reporting.

Nationally the declining enrollments in baccalaureate-level engineering programs represent an even more severe problem and observers are beginning to predict a forthcoming shortage of engineers. The projected shortage could reach an annual level of 10,000 engineers by 1975.[7] Of course, if the cyclical pattern described earlier continues to operate, this should mean an increase in engineering enrollments. In any case, the downturn of interest in engineering generally obviously affects technology programs as the latter serve many students who intend to transfer to baccalaureate programs.

Enrollment trends in engineering and engineering technology programs must be placed in the context of a stagnating demand for higher education in general. Total enrollment in four-year colleges seems to have reached a plateau and the proportion of white males age 18 and 19 who are in college has actually declined in the last two years.[8] Community colleges have also begun to feel the impact of this trend and there are indications that the period of large scale enrollment expansion in these institutions is coming to a close. California community colleges have experienced an enrollment decline for the first time in recent history and the rate of growth in enrollments for community colleges nationally has substantially declined.[9] Applications to four-year colleges in the SUNY system have fallen in the last two years and administrators in both two- and four-year colleges in SUNY have begun to worry about keeping enrollment levels up.[10]

The occupational and educational preferences of white males are of particular significance to engineering and engineering technology programs. Nationally (although not necessarily in New York) the number of women and black males receiving engineering degrees remains very small, although enrollment for both groups has increased in recent years. Our impression is that a similar pattern persists in engineering technology programs.

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[7] Appendix A, p. A4ff.

[8] New York Times, Feb.25, 1973, p. 52.

[9] Based on data presented in The 1972 Junior College Directory. Washington, D.C.: American Association of Junior Colleges, 1972.

[10] The Post Standard, Syracuse, N.Y., March 7, 1973, p. 10.

It is beyond the purview of this paper to judge whether these changes in enrollment trends indicate a major shift in the historic pattern of steadily rising enrollment in higher education or whether they are temporary deviations due to economic conditions, the end of the draft, or other factors. It must suffice to note that most informed observers feel that the growth in enrollment in higher education during the next decade will be moderate at first and that it will gradually stabilize and perhaps even decline. However, in this particular case events may have stolen the march on the forecasters.

To summarize, the engineering technology programs in SUNY community colleges function in a context of generally declining enrollments in engineering programs at both the associate and baccalaureate degree levels and an apparently stabilizing overall demand for higher education. The SUNY technology programs thus do not seem to be unique in their enrollment experience except to the extent that some of them reached a stable situation earlier than similar programs elsewhere and prior to the dampening of the expansive milieu in higher education nationally.

The situation described above of stable or, in some cases, declining enrollments in engineering technology programs is perceived by some state and college officials in the SUNY system to constitute a "problem" that requires some kind of ameliorative action. The "problem" has been defined by some of these participants in terms of poor or at least inadequate recruitment procedures and the obvious solution lies with improved recruitment strategies and practices. The question asked therefore is what can be done to make engineering technology programs more attractive to potential students. The approach taken in this report is somewhat different. We have not assumed *a priori* that the current enrollment situation should be treated as a problem of recruitment and expansion. Instead we have attempted to address the following questions:

1. Under what conditions should the enrollment pattern for engineering technology programs be viewed as a problem requiring policy action intended to increase enrollments in those programs?
2. Do these conditions prevail in New York State?
3. If the answer to the above question is positive, how are we to account for the current enrollment situation in these programs?
4. To what extent are the factors contributing to the current situation in these programs amenable to educational policy action?
5. What steps, if any, can be taken at the state, institutional, or program level to affect the desired changes?

The Prerequisites for Program Growth

If one takes the position that community colleges ought to serve as an educational broker between the needs of employers and the interests and abilities of potential students, then in the most fundamental sense, there are two prerequisite conditions for the intentional expansion of any educational program. Judicious policy action requires that both conditions exist; that is, they are necessary conditions. The first condition is an expressed need within the economy for trained manpower that cannot be easily met via on-the-job training or worker up-grading. The second condition is that there are individuals who are both capable of mastering the required skills and willing to voluntarily enter a program designed to provide them. Simply put, there must be individuals who are seeking or can be persuaded to seek, the training in question (presumably because of its utility in the labor market). This condition can be met if there is convincing evidence that there would be such individuals if certain barriers to access to the educational program could be eliminated.

It could be argued that the persistence of high youth unemployment rates provides the necessary evidence that the latter condition prevails. Two assumptions must be accepted in order to maintain that access to occupational training is a solution to the youth unemployment problem. First, it is necessary to assume that unemployed youth would accept the kind of work that is available. Second, the unemployment must be a consequence of the characteristics of the unemployed rather than the aggregate number of jobs in the economy. The first assumption is questionable but it is not fashionable to challenge it. The second is fashionable but unfortunately it is probably incorrect.[11] Typically the reasoning that underlies educational solutions to unemployment problems ignores the first condition stated above, or it rests upon inadequate estimates of demand for the skills in question. Thus effects on employed workers (job bumping) or other programs are ignored in evaluating a particular occupational program. In short, the presence of unemployed youth is not sufficient grounds for advocating expansion of specific career programs.

There are obviously less profound reasons for policy-makers to be concerned about enrollment levels. Declining enrollments lead to questions about efficiency and about economies of scale—especially during a period of scarce resources for higher education. Consolidating or eliminating programs poses difficult issues with respect to tenured faculty, the number of programs offered by particular community colleges, and equality of opportunity to acquire specific skills across community college service areas.

Department chairmen and other significant individuals in the policy apparatus may exhibit concern if their areas of interest fail to exhibit growth rates similar to other programs in their institutions. Thus, individuals with a stake in engineering technology programs are likely to be sensitive to the rapid growth of enrollment in health-realted curricula or criminal justice programs. Moreover, deans and other administrators accustomed to a growth situation may evaluate the performance and worth of a department and its faculty in terms of enrollment increases. Such concerns are not trivial and cannot be ignored but they are not sufficient justification for undertaking actions intended to maintain or expand the level of enrollment in a particular program.

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[11] See Thomas Carroll, "Economic Problems and Career Education" in A Preliminary Policy Analysis of Career Education. Syracuse, N.Y.: EPRC, 1972.

In this report we will concentrate on the two fundamental preconditions for recruiting students and expanding enrollments: a demand for the skills in the marketplace and a potential clientele for the educational services. The former condition will be addressed by examining the claim that there is presently or soon will be a shortage of technicians in New York and the nation. The latter condition will be addressed obliquely by trying to account for the current enrollment situation and asking who the potential new clients for engineering technology programs might be and why they are not now choosing to enroll.

Is there a Technician Shortage?

A review of the manpower literature leads one to conclude that a technician shortage has been a chronic or recurrent problem in the United States since World War II. During the 1950's the concern was primarily with shortages of engineers and scientists and there does not seem to have been much attention given to the need for engineering technicians *per se* until the 1960's. The increasing use of computers and related automation equipment and the desire to make better use of highly trained engineers and scientists have contributed to the growing concern about the supply of engineering technicians.

Two recent studies, one by the Bureau of Labor Statistics[12] and one by the National Industrial Conference Board,[13] have forecast manpower shortages in the engineering technologies by 1980 and 1975 respectively.[14] Neither of these studies took into account the more recent forecasts of a shortage of professional engineers and its possible impact on the demand for technicians. Nor did they foresee the declining enrollments of recent years; the BLS study was based on 1965 enrollment data and the NICB study used 1969 data to estimate supplies of technical manpower. It could be argued, therefore, that both studies provide conservative estimates of the potential manpower shortage.

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[12] Bureau of Labor Statistics, "Technician Manpower 1966-80." Washington, D.C.: Department of Labor March 1970 (Bulletin 1639).

[13] Rhine, Shirley H. and Danial Creamer. *The Technical Manpower Shortage: How Acute?* New York: The National Industrial Conference Board, 845 Third Ave., NYC 10022, 1969. 77 pp.

There are problems with such forecasts. One of these is the use of an educational criterion in defining what is meant by a technician. Both of the studies mentioned above and others of a similar nature define a technician as a graduate of a training program comparable to that of a two-year post-secondary technical institute. It is not clear that all potential employers use such a definition or that they will adhere to it when confronted with a manpower shortage. A 1964 survey conducted in New York found that:

> At the technician level, the training requirements are not self-evident. The survey conducted for the technical manpower study program produced the somewhat discouraging finding that employers of 53 percent of the technical workers in New York State did not require them to have completed any education beyond the high school. At the other extreme graduation from four-year college was required of 8 percent of employed technicians. Only 21 percent were employed in jobs which specified graduation from a two-year technical institute or community college."[15]

Conditions have changed since 1964 and engineering technicians may face different job requirements than technicians in general. But nonetheless, the translation of the demands of the labor market into educational requirements remains problematic. One important factor has been the expansion of community colleges during the past decade; the presence of these institutions may have contributed to credentials barriers to job entry that were not previously there.

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[14] See Appendix A for a more detailed discussion of the future need for engineering technicians.

[15] Knoell, Dorothy. Toward Educational Opportunity for All. Albany: SUNY, 1966, p. 37.

A related problem is the role of up-grading or on-the-job training in satisfying the demand for technical manpower. Although the Department of Labor suggests that employers prefer graduates of post-secondary training programs (and there is some empirical evidence that this is the case), there is also evidence that employers prefer maturity and experience to youth when hiring technical manpower.[16] Certainly one good indicator of a shortage situation would be an increase in the amount of up-grading in the work force to fill the need for technical manpower.

Employers can also adjust to a manpower shortage by re-organization of job roles, automation (factor substitution), or other changes in production techniques intended to reduce the need for the skills that are in short supply. Such changes can undermine the reliability of manpower forecasts and result in manpower surpluses. There seems to be little evidence available about what is actually happening in the industries supposedly confronted with the technician shortages with respect to up-grading, re-organization or factor substitution.

If there were a serious shortage of technicians that could not be resolved by the options discussed above, it is to be anticipated that wages in that occupation would rise sufficiently to attract recruits. It also should be anticipated that other benefits would accrue to individuals entering these occupations. These might be benefits that are controlled by the employer, such as working conditions, or they might be benefits such as higher social status, that are conferred by the larger society.

In a time when most if not all wages and salaries are rising, it is difficult to ascertain if increased wages in specific occupations indicate manpower shortages. It is difficult to determine from most nationally reported data how post-secondary technicians are faring. Are they to be found among the blue-collar occupations which are defined as "craftsmen, foremen and kindred workers"? Or in the white-collar occupations defined as "professional, technical and kindred workers" (where they might be aggregated with engineering degree holders)? Sackley and Gavett found that the annual compound rate of growth of median wages or salary incomes from 1964-69 was 6.0% for craftsmen, et al., and 7.1% for professional workers, et al. But it was 6.8% for "laborers" and 6.3% for sales workers and 7.8% for "managers, officials and proprietors."[17] Aggregate data such as this does not tell us if shortages exist in specific occupations.

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[16] Occupational Outlook for College Graduates, 1972-73. Washington, D.C.: USGPO, 1972, p. 203.

The preferences of employers impact upon the ration of technicians to professionals. Nationally the ratio is now about 63:100 but of course there is considerable variation across industries and among different types of technicians. Federal manpower reports typically use higher ratios (often as high as 6:1) on the grounds that employers would prefer to utilize more technicians per professional. The evidence on this question is mixed. Certainly the predicted shortage of professional engineers could produce a change in the ratio if more technicians were available.

To summarize, manpower forecasts can be misleading especially when they are of a long-term and aggregate character and are used for local or state planning. It is difficult to foretell the reactions of employers to the labor situation and to account for changes in industrial growth rates, mobility of workers, new technology, etc. These problems are over and above the reliability and validity problems that manpower analysts face in collecting their baseline data. Thus there is considerable danger in over-interpreting and over-reacting to manpower forecasts. The data is more useful for counseling than it is for planning educational facilities or allocating resources among educational programs.

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[17] Sackley, A. and Gavett, T. W., "Analysis of Occupational Wage Differences," Monthly Labor Review, Vol. 94, No. 6, p. 7.

What are we to conclude from this discussion? The evidence seems to indicate that nationally we do face a shortage of engineering technicians but that we need to know more about how employers are coping with the problems. A somewhat cautious response by educational policy-makers seems to be the most prudent course.

However, national shortages may or may not affect a particular state. New York has frequently used national manpower data on the grounds that New York's manpower profile is similar to the national situation. Yet in the case of engineering technicians, there are some significant differences between New York and the rest of the nation. Unemployment among engineering technicians has been lower in New York (3.2% in 1972) than in other parts of the country (it was 5% in California in 1972). The expected growth rate for technical manpower in New York has been estimated to be about 2.5% compared to a national figure of 3.4%. And finally New York's post-secondary programs seem to be meeting manpower needs more effectively than is generally true of the rest of the nation. This conclusion is based on crude estimates of the proportion of the needed manpower provided by graduates of post-secondary programs.[18]

From the above evidence, we would conclude that a manpower shortage for technicians would not be felt as severely in New York as elsewhere in the nation. Thus our first condition for expanding technology programs is only tentatively met. Despite their stable enrollments, these programs are apparently doing an adequate job in satisfying the need for technical manpower. Whether it is good enough to satisfy needs in the short-run future seems to be uncertain. Yet the available evidence does not justify any hasty efforts to bring about significant expansion of these programs. Overall declines in enrollment in the engineering technologies would be a cause for some alarm but decreases in specific programs may only reflect responses to market conditions.

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[18] Appendix A, pp. 17-20.

III.

FACTORS AFFECTING ENROLLMENT LEVELS

The level of enrollment in any educational program is influenced by a complex set of variables. Most of these variables fall into one of three categories: (1) the conditions in the labor market over time; (2) the characteristics of the program clientele and changes in these attributes over time; and (3) characteristics of the educational program itself. In reviewing these factors, we have three objectives. First, we want to specify a range of factors that influence enrollment in a given program. Since this document is intended to serve primarily as a basis for discussion among community college educators and since conditions vary considerably among community college service areas, it is appropriate that our analysis be inclusive rather than exclusive. Second, we want to make some judgments about the relative weight of these factors with respect to enrollments. In some cases, the evidence is so thin that such judgments amount to informed conjecture. Finally, we want to decide which factors, if any, can be affected by educational policy interventions and at what level.

A. The Labor Market

Among the economic variables that impinge upon the curricular choices of potential engineering technology students, the following seem to be the most significant:

a. the wages of the occupation relative to reasonable alternatives
b. opportunities for employment in the field in question
c. opportunities for career advancement
d. non-pecuniary benefits associated with the occupation
e. the presence of better opportunities for the same potential clientele

The conditions facing prospective engineering technologists with respect to these factors can be summarized very briefly.

Wages

The data on wages for technicians is not very good. The Department of Labor cites starting salaries from $6,500 to $8,300 per year with an average of about $7,400. The Bureau of Labor Statistics found that one-fourth of technical workers had salaries exceeding $11,900.[19] Interviews with placement officers in New York community colleges and with a few employers suggest that these figures are representative of conditions in New York. While these starting salaries seem quite competitive with opportunities open to graduates of other associate degree programs, it appears that the earnings of technicians level off rather rapidly. In many companies the cost of a new engineering graduate appears to set a ceiling for salaries for technicians. Simply put, other things being equal, employers may prefer to hire another engineering graduate rather than promote a technician. In this situation, a technician must pursue an engineering credential or move into another field such as management or sales in order to increase his income.

Opportunities for Employment

The perception that a particular career field suffers from severe job competition and periodic unemployment reduces the propensity of potential students to enter training for that field. This appears to have occurred for the technical professions. The recent unemployment problems in the aerospace and defense industries were magnified out of proportion by the mass media. Such highly visible unemployment may have had a deterrent effect on many who might have enrolled in technical training programs.

In New York, however, such perceptions are out of tune with the actual labor situation. The 1972 Manpower Report of the President says that unemployment for those in technical professions in New York has been no more than 3%, lower than those areas afflicted with severe aerospace cutbacks. Furthermore, even those states most severely hit by these cutbacks have unemployment rates for technicians of less than 6%. In other words, the demand for labor in the technical occupations is quite healthy.

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[19] Occupational Outlook for College Graduates, 1972-73. op. cit., p.205.

Career Advancement

Two types of opportunities for technical workers could affect the influx of new people into technical programs. First, there is the opportunity to advance upwards, to increase one's status and salary in a job at a higher level than what one starts with. Second, there is the opportunity to move laterally from one technical area of the labor force to another which is similar in skills and other required competencies. For instance, a potential recruit for a technical program in electrical engineering might feel more secure about this career choice if he knows he can also work in mechanical engineering.

We know little about the opportunity structures for technicians who want to advance upwards so long as they remain technicians. We know even less about the way in which potential clients of technical programs perceive such opportunity. However, there is evidence that technicians often advance to the higher status of engineer or scientist by attaining the appropriate educational credentials. There is a career ladder, but our impression is that it entails difficult educational hurdles. However, not all observers adhere to this view of the situation. "Many employers have indicated that it has been more difficult to upgrade workers to technicians in recent years than to upgrade technicians to engineers," says a National Industrial Conference Board Report. "This may mean that many of the best qualified technicians are being promoted to engineers which, while alleviating the tightness of the supply of engineers, has perhaps contributed importantly to the shortage of technicians."

There are no precise assessments concerning the extent of such upgrading, or the response of employers to different labor pressures. While the flooding of the market with college graduates might seem to dampen upgrading, Ivar Berg in his book Education and Jobs: The Great Training Robbery indicates that some employers prefer those with the lower degree so that they may supplement the college training with their own.

The opportunities for lateral movement also elude precise measurements. There is no solid evidence one way or the other that employers will hire electrical engineers when they ask for civil engineers. To an extent, the question of lateral movement raises an issue endemic to vocational education, namely, whether programs should provide job-specific skills or concentrate on basic and generalizable skills.

Our impression of New York technical programs is that they present a good combination of both. First, they are oriented to specific fields and occupations. The person with training in civil engineering can be expected to have specific skills and experience more for constructing highways than wiring electrical circuits. But, second, the training underlying the different technical fields can be generalized. There is necessarily a common base of mathematics and physical science. For instance, the civil engineer to do his job well must be able to understand both electrical and mechanical engineering approaches, even though his understanding may not be as deep as that of a mechanical or electrical engineer.

Non-Pecuniary Benefits

Some workers will choose a lower paying job if there are compensating benefits. These may take the form of better working conditions, greater job security, more enjoyable colleagues or higher social status. Teaching is often used as an example of a job with significant non-pecuniary benefits.

Specifying these benefits for engineering technicians goes far beyond the scope of this study. However, our limited search yielded little information on this issue. Even more important than the reality is the image held by those who constitute the potential market for these programs. Market research is needed both to correct distortions and misinformation among potential clients and to provide inputs into the programs themselves.

Other Opportunities

The expansion of more attractive sectors of employment also influences preferences for technical programs. Higher income, superior work conditions, geographic location, and their congruence with the prevailing values in the youth culture may make other career areas more attractive than technical ones. The job preferences implicit in the mass media and the educational system, both of which are major sources of occupational information for youths, may also have a major effect. Examples of this process are the current growth of human service programs such as para-medical professions, police science and teacher aides. While enrollments in technical areas have been stagnating or declining, enrollments in the human service areas have grown rapidly during the past five years.[20] Now that demand in these areas is slowing down, and in some cases, drying up, enrollment shifts might be expected. These changes in career preferences in response to changing market conditions might benefit technology programs.

One of the more recent efforts to assess student perceptions of occupational prestige was Project SCOPE. This study, conducted by the Center for Research and Development in Higher Education, revealed a clear preference for human service occupations over technical fields. This was particularly true for girls who almost universally rejected technical jobs but it was also true for boys.[21]

Summary

Technicians make average salaries and probably earn less than those employed in the trades in many cases. On the other hand, they have little difficulty attaining jobs and the work is usually secure. They face limited opportunities for advancement without attaining other educational credentials.

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[20] See Appendix B.

[21] SCOPE Grade Eleven Profile: 1968 Questionnaire New York: CEEB, 1969.

Finally, there are many equally attractive, if not more attractive opportunities for individuals of similar talents. In short, the economic incentives for being a technician are rather limited although they are positive factors overall.

B. The Market for Technical Education

All educational programs operate upon a set of explicit and implicit assumptions about their markets. In part, these assumptions reflect the positions of educational decision-makers with respect to the student attributes deemed appropriate for participation in a program and, in part, they reflect pragmatic adjustments to the actual market for the educational services provided. Thus, any discussion of the market for a given program must take into account the following:

a. the attributes of the students sought by the faculty and the program administration;

b. the educational preferences and options of potential students;

c. the possibilities of expanding the pool of potential students.

Students Preferred by Engineering Technology Programs

The most obvious indicators of faculty preferences with respect to the attributes of students are found in admissions criteria. However, in "open door" institutions such criteria are often unstated and tend to be implicit and subtle. These criteria do not operate like admissions standards in selective institutions. Instead, they serve as malleable and unstated decision rules to screen applicants. They are used to differentiate students among programs within an institution and to decide which students will be asked to do remedial work prior to matriculation or which ones will be urged to attend evening classes rather than enroll as full-time students.

These implicit admissions criteria often are unreasonably demanding as a result of the desire of occupational programs to overcome their lower status vis-a-vis liberal education. Moreover, two-year college faculty may see the standards as a device to differentiate their activities from those of high school vocational education teachers. If the faculty sees its function primarily as that of preparing students for baccalaureate level engineering programs, high standards for admissions may be quite reasonable. Entrance requirements at engineering schools rose during the 1950's and 1960's.[22] While it is not known what has happened to these standards in the last few years, it is clear that engineering programs continue to make higher intellectual demands on students than most other undergraduate programs. The math and science requirements are heavy, and engineering students have less choice or flexibility in their curriculum than those enrolled in other undergraduate programs.[23]

It can be inferred from these generalizations that engineering technology programs might make greater academic demands on their students than other two-year career programs. This conclusion is supported by the interviews conducted during the course of this study. Logically, this would imply either higher admission standards or higher attrition rates. It would also serve to deter many students from applying at all.

Unstated admissions criteria are often well-understood by potential students and serve as a barrier to application for admission. Simply changing the admissions practices may not suffice to overcome the "reputation" of the program; a more active campaign may be required to remove widely held impressions as to who is "eligible" to enroll. The scope of this study did not permit us to assess the admissions practices of engineering technology programs in New York nor have we any empirical basis for estimating their impact on student preferences. Nevertheless, any faculty that is thinking through its recruitment problems must be aware of its reputation with regard to admissions.

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[22] American Society for Engineering Education "Factors Influencing Engineering Enrollment," Washington, D. C., ASEE, 1965, p. 26ff.

[23] Ibid, p. 30ff.

Another approach to this question is to examine the characteristics of students currently enrolled and make inferences from this data about admissions criteria. Unfortunately, data of this type is unavailable. There have been national surveys of students enrolled in occupational programs but these have not been disaggregated by curricula. This severely limits their utility since there are reasons to believe that engineering technology students are not typical of the student population of occupational programs.

Given the absence of such data, we must fall back on the data collected in field interviews and impressions of those familiar with technology programs. These sources suggest that the preferred recruits for engineering technology programs are:

a. white males,
b. recently graduated from high school,
c. with above average math and science preparation and aptitude,
d. some mechanical ability,
e. and a career commitment to engineering, although not necessarily an interest in attaining a baccalaureate degree in the field.

Such individuals constitute a rather small segment of the total population seeking post-secondary education. They are the preferred clients of other types of post-secondary programs. Moreover, as we shall see below, the educational and career preferences of high school graduates are undergoing change and their options are expanding. It may no longer be possible to recruit students on the basis of these attributes in sufficient numbers to maintain enrollment levels. And, of course, it never was desirable to exclude women or racial and ethnic minorities.

This reality is reflected in the lowering of the unstated admissions barriers referred to above and in the development of pre-technical programs. For many technology programs, the total pool of high school graduates is seen as the potential market. Yet it is generally difficult to attract students (whatever their abilities) into engineering-related fields. We shall turn to this problem next.

The Preferences and Options of Potential Students

In a recent follow-up study conducted by Project Talent, significant changes were found to have occurred between 1960 and 1970 in the factors important to American youth in the selection of a career. Table I presents some of this data. Significant shifts took place in the importance attached to income, career advancement, and job security. This data reflects some of the value changes that have taken place as a result of the much-discussed "cultural revolution" of the 1960's.

It is not at all clear how these findings ought to be interpreted. Before his death, Richard Hofstadter, writing in Newsweek, decried the tendency of contemporary youth to drift.[24] He described the new generation of students as lacking in a sense of vocation. He felt they were characterized by the absence of the desire to do anything well. Hofstadter's judgement is undoubtedly premature and overly harsh. Yet there does appear to be a tendency to avoid closure, a desire to maintain options that impacts upon the career and educational preferences of contemporary youth. This may seem to be in conflict with the "new vocationalism" that has emerged in the 1970's, but there is no necessary contradiction. Contemporary students are interested in economic benefits and are certainly concerned about attaining jobs. However, they seem more sensitive than earlier generations to the opportunities for eventual career change latent in a particular field and much less likely to expect to spend their entire working life in one occupation.

These differences are reflected in research on career choice and on the stability of such choices. The Project Talent Study cited above found career choices of high school youth to be highly unstable. Data on the 1960 sample

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[24] July 6, 1970, p. 20.

Table 2

FACTORS IMPORTANT IN CAREER CHOICE (BOTH SEXES)[25]

	Extremely Important and Very Important		Unimportant and Neither Important or Unimportant	
	1960	1970	1960	1970
Good income to start	54.3	40.2	14.5	19.7
Job security	64.2	55.1	10.3	12.9
Work that seems important	74.4	76.8	6.7	4.9
Freedom to make our decisions	55.4	64.6	16.4	9.6
Opportunities for promotion and advancement	65.0	53.2	13.5	17.4
Meeting and working with friendly people	66.0	65.1	11.9	10.4

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[25] Project Talent, Program in Education: A Sample Survey (1960-1970). Palo Alto: American Institutes for Research, 1971. Table compiled from data in Appendix D.

revealed only seventeen percent of male high school freshmen and thirty-one percent of male seniors held the same career aspirations one year after their high school graduation.[26] The 1970 data show career aspirations to be even less stable, and there is a definite tendency towards making later career commitments. However, the 1970 data also revealed contemporary students to be much more hardheaded in matching their abilities and aspirations than students were a decade ago.[27]

What does this data imply for community college engineering technology programs? Numerous studies have found community college students to be more concerned with the economic benefits of education than their peers in four-year programs. Since they are more job-oriented and the programs are shorter, their choices must be clearer and necessarily are made more quickly. Current research shows most students select their careers after entering college. Thus, the community college student has special handicaps.[28] This suggests the need for more career awareness activities and wider experience in the high schools and an effort by community colleges to provide career education for incoming freshmen prior to forcing them to make costly curricular choices.

There has been considerable research on the factors influencing career choices among youth. The most important of these factors are obvious: parental aspirations, social status and attitudes, the abilities of the student, his performance in school, and the attitudes of his peer group. This research is summarized elsewhere and need not be reviewed here.[29] Most of it has focused on factors that are not directly subject to policy interventions. However, the research does suggest some intervention points. It suggests that reaching parents and teachers may be far more important than reaching counselors. This may be especially true of potential community college students since they are less likely to receive attention from counselors. It also suggests that early exposure to occupations is important since the images formed during the school years are difficult to reshape.

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[26] Project Talent, op. cit., p. 3.

[27] Ibid, p. 13ff.

[28] See Chapter 1 in R. Freeman, op. cit.

[29] For example, see A. O. Haller and A. Portes, "Status Attainment Processes," Sociology of Education (Winter 1973), Vol. 46, No. 1, pp. 51-91.

The schools generally do a poor job of preparing youth to make career choices. Children and adolescents are isolated from--indeed, protected from--the world of work. As the emerging literature on career education repeatedly notes, children may never see their own parents at work and seldom have the opportunity for sharing such experiences. Yet awareness of the skills and satisfactions related to a specific career requires direct experience. Students need to understand the life styles associated with various occupations. Schools as they are now constituted seldom provide such opportunities. It is no wonder so many adolescents aspire to be teachers. It is one of the few occupational roles that is familiar to them. Engineering and engineering technology are relatively unfamiliar fields and few adolescents comprehend the skills, tasks, or rewards associated with such careers.

The role of the mass media in shaping the career aspirations of youth remains relatively unstudied. Yet occupations are stereotyped along rather narrow cultural dimensions by the mass media. Doctors, lawyers, and scientists are shown as high status, influential individuals; but craftsmen and workers seldom appear except as objects of ridicule. Moreover, plumbers, electricians, grocers, and technicians are never shown living in the economic conditions to which their real income often assigns them.

How do modern youth feel about engineers and engineering technicians? Data on the prestige assigned to various occupations by high school students correlates highly with similar data collected from adults, and both groups rank technical occupations as low-prestige jobs.[30] Even engineers are not perceived to be high prestige individuals. Rather, the image held by youth is that of a job requiring high talent and great effort in return for moderate income and status.

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[30] ASEE, op. cit., p. 18.

One wonders why so many talented people choose engineering as a vocation. Yet its popularity remains high among boys. The Project Talent data show eighteen percent of male high school students listing engineering careers as their preference in 1960. This figure had declined to fourteen percent by 1970. It is noteworthy that this same study found increased preference for careers in social work, science, law, law enforcement, etc. This tends to confirm the observation made earlier that the social relevance of the occupation is an important consideration for contemporary youth in selecting a career.

Finally, there are several important factors that are expanding the options confronting new high school graduates. The first and most important is the expansion of access to four-year programs. The fiscal crisis in private colleges, open admissions policies, stagnating enrollments in public four-year colleges and declining public school enrollments have made it easier to gain admission to a four-year institution in the past few years. This trend is likely to continue.

The second factor is the growth of technical programs in the four-year colleges. Nationally, these programs doubled their enrollments from 1967 to 1970 and doubled them again from 1970 to 1972. Programs are offered in over sixty fields. These developments have caused concern for many community college educators. While this is not yet a severe problem in New York State, there is growing competition for students between two-year and four-year campuses; and other things being equal, this competition is likely to increase in the future.

Then there is the end of the draft and the introduction of the voluntary armed forces that may have a double-barreled effect on college enrollments. The draft forced many young men into college, particularly into the community colleges. Many were unwilling students. This group has been estimated to be as high as one in six of all students. Of course, the draft is not the only reason that students attend against their will. Parental pressure and the lack of jobs may also have this effect. Nevertheless, there has been a slacking of enrollments since the draft ended. To attract volunteers, the armed forces are offering cash incentives and a wide choice of career training programs. These attractions may yet take their toll on the pool of potential college students and are likely to have greater impact on the community colleges than four-year schools. This is conjecture at this point, but the impact ought to be watched as it could affect particular programs severely.

New Clients for Engineering Technology Programs

The market for engineering technology programs can be expanded in several directions. The most obvious possibilities lie in the recruitment of blacks and women into the engineering dields. Only 2.1% of all black freshmen, men and women, entered engineering fields in 1970; proportionately, this represents a decline from 1966.[31] This is significantly lower than the figure for whites which has remained above nine percent over the past six years.[32] If the data on whites is disaggregated by sex, males are shown to be over thirty times as likely to enter an engineering program. The experience of the Soviet Union demonstrates that there are no legitimate reasons for such a discrepancy to be continued. Several four-year engineering schools have begun to recruit women aggressively, but we know of no engineering technology program that is following suit.

The solution to the low levels of enrollment on the part of ethnic minorities and women lies in overcoming deeply ingrained stereotypes held by the public and by employers. While more information and better counseling would help, the best approach would be to recruit female and black faculty. Nothing speaks louder than such affirmative action. Given the limited supply of black and female engineers, this may be quite difficult. These difficulties could be overcome by offering working professionals adjunct faculty positions, seeking joint appointments, waiving credentials requirements, and otherwise searching for creative solutions.

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[31] These data were compiled from National Norms for Entering Freshmen: 1966 to 1972 (Washington, D.C., A.C.E., 1966-72).

[32] Ibid.

The other major area of potential recruits lies in the adult work force. In this decade, the number of workers in the age bracket 25-34 will increase by 48.4% and will constitute nearly half of the entire work force.[33] Three-quarters of these workers will not hold college degrees and many will be looking for ways out of routine jobs. Worker alienation is already a serious problem in many industries.

Educators should aggressively look for ways to bring their services to these individuals. They must invent new delivery systems. They should devote more attention to the part-time adult student. Colleges that continue to treat "continuing education" as a peripheral activity are likely to be in trouble by the end of the decade.

Tapping this market means lobbying for new forms of financial support for adult students. It may mean helping employers and unions develop new career ladders. It means playing down the youth culture atmosphere of most college campuses. Finally, it means sensitively responding to the "fear of failure" that characterizes most working-class adults in their approach to education.

The final point above applies to most of the "new students" entering post-secondary education whether they are young or not so young. As Patricia Cross points out in her perceptive discussion, the new students are best characterized by their experience of failure in the public schools rather than sex, ethnicity or social class.[34] Simple mathematics reveals that a student in the middle of his class in the eighth grade will be in the bottom quartile as a high school senior due to the dropping out of those below him. This has lasting psychic effects on many individuals. Persuading these people to seek post-secondary education and offering opportunities for successful performance may require the invention of new curricula and new pedagogies.

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[33] Manpower Report of the President, 1972 (Wash., D. C., USGPO, 1972).

Summary

Engineering technology programs have tended to recruit from a rather restricted pool of potential students due to their standards and due to cultural biases about who could enter the engineering professions. Conditions have changed. Competition for students is increasing, and the values of the youth culture tend to mitigate against the selection of engineering as a career. At least that is true given the image of the engineer as an industrial technocrat. New markets are available, but they will require considerable changes in behavior on the part of those running engineering technology programs.

C. Characteristics of Engineering Technology Programs

Observations about the students and faculty, admissions standards, and the size and number of these programs have appeared in earlier sections of this report. Here we will briefly comment on the content of the programs and their institutional setting. There is little in the way of research to go on, and what there is tends to lump all occupational programs together. Nevertheless, some tentative observations can be made.

Occupational education in the United States is generally oriented to skill packages associated with particular occupational roles. It does not typically include intensive foundation training in technical sciences or mathematics. In this respect, it differs from the European concept of further education. This is rather ironic given our national commitment to the importance of general education.

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[34] Patricia Cross, Beyond the Open Door, San Francisco: Jossey-Bass, 1971.

There is considerable confusion in the research literature on the relative benefits of generalized training versus specific skill training. Some of the research seems to point to a future in which occupational programs provide basic skills related to the career field and industry provides instruction in the job-related skills through on-the-job training. In any case, graduates of programs with more generalized curricula seem to have better employment experience; but no causal inferences can be made from the existing data.[35]

Occupational programs also seem to be characterized by a lack of concern with the emotions and senses of their students. This charge can be made against higher education generally, however, and individuals commuting to local community colleges may not need as supportive an environment as residential college students.

Engineering technology programs probably suffer from the problems alluded to above as much as other career programs. Yet they seem less likely to be narrowly skill oriented and contain math and science components that have general applicability. In this regard, they ought to be more attractive. However, as was noted in an earlier section of this paper, there is no evidence about the extent to which such skills are transferable across fields within engineering.

Engineering technology programs function in an environment that places its highest priorities elsewhere. Until recently, liberal education was a high status curriculum on most community college campuses. Technology programs competed for students by maintaining high academic standards and working to get their students admitted to baccalaureate programs. Now the human service programs are riding high and the engineering technologies suffer from an "establishment" image. They are dull stuff compared to medical technology or police science. In short, engineering technology programs suffer from an image problem on their own campuses and this affects their ability to recruit.

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[35] See G. Somers and Susan B. Fernbach, An Analysis of the Economic Benefits of Vocational Education at the Secondary, Post-Secondary and Junior College Levels, Madison, Wisc., University of Wisc., Center for Studies in Vocational and Technical Education, 1970.

IV.

RECRUITING TECHNIQUES

Little research has been done in recent years regarding the recruiting of students into college work-related programs.[36] Recruitment has tended to be a trial and error thing. Some colleges and programs have conducted their own small-scale research regarding their own students. Others have reported recruiting programs that they systematically developed over a period of time. Yet the generalizability of such research and development to other programs is uncertain.

Research dealing with recruiting itself has typically fallen into at least one major trap. It has treated sundry recruiting techniques as being separate and unconnected rather than as part of an overall strategy. For instance, it has tested the effectiveness of television versus school catalogs as techniques. Or it has simply reported the success of such things as job fairs with the implication that job fairs alone may increase the return on recruiting efforts rather than job fairs in connection with television advertisements or catalogs. This approach could cause schools to concentrate on arrays of single recruiting techniques with little feeling for the ways in which the techniques work together. It also risks the use of a single technique as a panacea for poor recruiting efforts.

The Burke, Gappert, and Knoell papers in the Appendices[37] begin to consider this problem of developing strategic perspectives on recruiting rather than a potpourri of apparently unrelated techniques. Each paper suggests a different way in which recruiting techniques may be utilized for different results in different situations.

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[36] Some of the sparse research on this topic is summarized in Appendices D and E.

[37] See Appendices C, D, and E.

Three Recruiting Strategies

Knoell approaches recruiting from the perspective of career development, adopting the developmental paradigm which the Office of Education is utilizing in the implementation of career education: career awareness, followed by career exploration and implementation. The Office of Education has applied this three-step paradigm to the different levels of the educational process. Thus, career awareness is seen as a function of the elementary school years, while exploration comes in junior high and high school and implementation follows during the last part of high school and proceeds into college.

The paradigm receives some justification from the literature on career development. For instance, the work of Tiedeman and O'Hara (1963; 1972) indicates that the process of career choice seems to follow an exploration-implementation pattern. The process is not irreversible, and a student might abandon one choice to go back to exploration. In a fundamental way career education is intended to facilitate the making and implementing of career choices.

Until career education fully permeates the school system, Knoell suggests that technical schools must use intervention techniques to redirect the career development of a particular person. Her basic strategy, then, is one of career intervention. Her paper describes a virtual arsenal of techniques available to the resourceful college recruiter.

Burke develops a strategic perspective based upon work done by communications theorists who have dealt with the persuasion process. Rather than concentrating on redirecting an individual's career through intervention, as Knoell does, Burke concentrates more upon persuasive techniques that may be utilized to recruit from a mass audience. His basic strategy, then, is one of mass persuasion.

Gappert approaches the recruiting problem somewhat differently. Initially he notes two economic arguments regarding the recruiting of students. One says that students will base their decisions about which programs to enter on the economic return they can expect to derive from their training. Thus, the student faced with a choice between training that will lead to one occupation with an average of $9,000 and training leading to an average income of $12,000 per year will choose the latter program.

A second argument says that students will pick the training that leads to an occupation in which higher incomes are more likely than in a second occupation, even though the second occupation might have a higher average salary than the first. The argument states that students, having made their choices, will use educational and other strategies to maximize their income. Consequently, a student who sees greater possibility for a higher income in a college professor's job than that of a mechanical engineer will choose to be a professor and then try to reach the highest salary level possible. From the second argument, Gappert suggests that the students who choose technical education are making strategic decisions to maximize their later salaries. These people, he argues, can be said to have certain characteristics in common. That set of the characteristics defines the recruitment pool for technical education.

The implicit assumption of Gappert's argument is that the students in this pool will naturally decide to enter technical education. It is to their economic benefit to enter. For Gappert, recruiting is not a matter of directing different techniques toward students in the hope of persuading them to enter technical education; recruiting must enlarge the pool of people who could conceivably decide to enter a technical program. His basic strategy is one of making more people eligible for a given program.

Tactics

Each of the above strategies implies that a particular set of techniques or tactics is most appropriate for attaining recruiting goals. Following the career development paradigm, Knoell classifies her recruiting suggestions by age group and guages each set of suggestions to the particular developmental stage that the group is likely to be in. She uses five groups: those in primary schools, junior high schools, high schools, and colleges and universities, and those past the age of schooling.

For those in primary school she indicates the efficacy of informational and exposure techniques that help students to understand and be familiar with technical careers. She suggests "strong, direct intervention" for those in junior high schools who might be locked into a tracking system and unable to explore the possibility of a technical career. At the high school level, she mentions the need for skill development so that students will have the ability to succeed at the college level. This is in addition to intervening in the career development of students by changing their attitudes toward technical careers and encouraging potential recruits for technical programs to go to college.

For the college level she designates three groups to which recruiting should be directed: those from racial and ethnic minorities who may mistakenly associate technical careers with low-class blue-collar jobs; those who are uncertain about their majors and might do better in technical programs than the liberal arts; and drop-outs who technical programs might salvage. Finally, Knoell suggests basically informational techniques for adults, particularly those who are re-exploring career possibilities, such as veterans or housewives re-entering formal education.

A strategy of persuasion deviates from the developmental strategy by concentrating less upon the individual and more upon the arguments made to persuade people to enter technical programs. It employs three basic techniques.

The first concerns the sequencing of different media to be utilized in persuasion. Communications research suggests that people are best convinced to make innovative decisions, such as entering technical programs, when they are first made aware of the possibility of entering a technical program, and, second, have the decision to enter such a program legitimized so that they feel comfortable in making it.

The first function is primarily one of broadcasting information to large numbers of people who might potentially be interested in entering a technical program. Most appropriate for this purpose is the employment of one-way media such as television, radio, and letters. The second function is primarily one of personal contact with interested people to persuade them that the choice to enter a technical program is a good choice. Most appropriate for this purpose is the employment of two-way media which allow dialogue and personal contact, such as counseling, discussion groups, and visits to the facilities of technical programs. A proper recruiting sequence for technical programs, then, might be a movie on technical careers followed by a discussion or individual talks with counselors or faculty for the technical program. Another possibility is the use of television advertisements with a follow-up of personal interviews for those indicating interest.

The second technique involves the nature of the arguments made to recruit someone into a technical program. Testing generally shows a better response when both sides of an issue are presented rather than only one. More appropriate than propagandizing technical careers by showing only the good side, then, would be presenting a balancing view with the good and bad both acknowledged.

The third recruiting device also concerns the content of any arguments and suggests that the conclusion to enter a technical program be left implicit in any arguments made by recruiters. From this perspective, letters that explicitly state that people should enter technical programs on the basis of the information presented will bring less favorable responses than those without stated conclusions.

The economic model that Gappert develops does not directly deal with questions of technique. Nevertheless, a variety of tactics are implicit in his arguments.

First, those in the recruiting pool may not be aware of the economic advantages that technical education may hold for them. With inadequate or incorrect information, they may enter other programs instead, perhaps ultimately losing from their decisions in an economic sense. Therefore, one technique is to provide information to potential recruits on the economic benefits of technical careers.

Second, the recruiting pool is not constant in size. Technical programs may enlarge it, thereby enlarging the potential number of students, through at least three tactics. One involves the training of students so that they may successfully meet the entrance requirements for the programs. A second concerns the direction of recruiting efforts to groups who might not now consider technical programs. This would include women and racial or ethnic minorities. Related to this is a third tactic which legitimizes the technical programs for those who might otherwise feel that going into such a program would be somehow inappropriate. This would include those who feel they must enter four-year colleges or go into liberal arts fields. This goal might be furthered by attacking the terminal image of the programs, reducing their separation from the liberal arts fields, and placing more stress on general skills.

Alternative Recruiting Actions

There are a number of specific ways to go about recruiting students, each of which is independent of the particular recruiting strategy that one employs. Rather than classifying the alternative actions by schemes which follow from a particular strategy, we will present a more general and composite scheme that begins to take into account all three strategies.

First, there are those actions to enlarge the recruiting pool. Second, there are actions which provide information. Third, there are actions that legitimize technical programs or otherwise persuade students to enter the programs.

I. Enlarging the Recruiting Pool

A. Behavioral Changes in Self-Concepts

1. The use of role models of those with successful technical careers and who are women or members of racial and ethnic groups.
2. Letters from community colleges to junior high school graduates telling them of the opportunities at community colleges.
3. Dampening the aspirations of those who want to go to four-year schools but do not have the capabilities.

B. Behavioral Changes in Capabilities

1. Utilization of pre-technology programs to better prepare students.
2. Development of a technology preparation sequence which may be used by those out of high school or those needing a "refresher."
3. Placement in summer cooperative programs with business and industry for orientation to technical jobs.

C. Incentives

1. Allowing the two-year technical curriculum to fulfill, at least in part, the requirements for a B.S. in engineering.
2. Attaching technical programs to four- and five-year engineering programs.
3. Giving students enrolled in technical programs special financial grants.
4. Giving those in technical programs access to special personal services, such as child care or tutoring.

5. Guarantees of job placement upon graduation from a technical program.

6. Offering assistance for students wanting to transfer after completion of a technical program.

II. Information

A. Curricular units for elementary and junior high level which relate various subjects to technical education.

B. Exhibits on technical programs at county fairs and other community events.

C. Speeches about technical programs.

D. Radio announcements about the programs.

E. Television announcements about the programs.

F. Exhibits and open houses at the community college.

G. Motion or still pictures of program facilities.

H. Motion or still pictures of the career opportunities for technicians.

I. Posters and placards.

J. Billboard advertising.

K. Picture stories of programs as told through mounted photographs in public and community buildings.

L. College catalogs.

M. Booklets, leaflets, and flyers on the programs.

N. Direct mail promotion.

O. College newspaper advertising.

P. Articles or news releases for local newspapers.

III. Persuasion

A. Job fairs.

B. The organization of pre-technical special-interest groups for high school students, such as engineering clubs.

C. The opening of college classes to senior high school students who want to take the courses for credit.

D. The visitation of classes for technical programs by potential students.

E. Tours of the program facilities.

F. Exploratory courses in high school to stimulate interest in technical programs.

G. Visits to high school by faculty in the technical program to interview interested students.

H. Development of contacts between college counselors and potential students.

Relative Merits of the Strategies

It should be apparent from the above that each of the strategies is appropriate for different sorts of situations. Each approach involves different sorts of efforts and pay-offs. Insofar as the intervention strategy concentrates on the individual career development of students over their entire stay in school, it is bound to take a great deal of resources and effort. Similarly, the pay-off for that effort would take years to assess properly and completely. By limiting its focus and taking only students in high school, the required effort can be reduced.

The communications strategy would require less effort--the major portion of the expense coming largely from the costs of movies, radio and television ads, or letters. In addition, the results are apt to be immediate but impermanent. From the research it is apparent that the effects of even a year-long recruiting drive using a communications strategy taper off after a year or two. Moreover, the numbers recruited would probably not be as great as those eventually won over with an intervention strategy. Mass persuasion may only convince those who have almost made up their minds or are in a position to enter a technical program immediately. Intervention aids students in planning for such a program over a period of years and thereby is likely to be the more effective approach.

The economic strategy represents a compromise. By only dealing with certain groups of students, the total effort need not be as high as that of the intervention approach, nor will the results be as long term.

Implementation is another aspect in which the strategies differ. While the communications strategy might be implemented almost solely by community college personnel, the other two require the active cooperation of personnel in the K-12 system. The public school personnel must be willing to bend their curricula and counseling efforts to favor technical education--or at least to give it a fair chance against other alternatives that they present to students.

At this stage it is tempting to posit a more integrated theoretical model and strategy for use by community colleges. The extent and quality of the research does not justify this. There is too little precise research, and what has been done concentrates less on general recruiting strategies and more on individual recruiting techniques.

Furthermore, the strategies are based on differing sets of theoretical perspectives. Regarding the ways in which people make choices, Gappert's approach has a fundamental premise that humans choose for economic benefits; although Gappert is careful to note that people often deviate from this model. Knoell has implicit in her strategy the idea that people will rationally lay out their career alternatives and ultimately choose one that is appropriate given their skills and aspirations. Burke employs a perspective that assumes humans to be malleable by the social forces of persuasion and legitimation.

The consequence is that on a theoretical level these models are not immediately reconcilable into a single theory or strategy. Any such theory must make assumptions about the nature of individual choice that are challengeable. This does not negate the value of the strategies. Rather, one must see them as heuristic devices instead of applications of social theory. This has one further consequence. There is no reason not to utilize the different strategies together, to mix them according to varying circumstances. At this point, recruiting becomes more of an art of the particular recruiter than a science applicable by anyone, and the above discussion offers suggestions rather than firm guidelines.

V.

RECOMMENDATIONS AND CONCLUSIONS

In a fundamental way, the recruiting problem for technical programs is simply that of persuading a single person to make a single choice to enter a single technical program. Ultimately, any recommendations that we make concerning the recruitment problem have such individual choices as their final goal.

Reaching such a goal does not work as simply as the above statement suggests. Of course, a recommendation may suggest an action which is directly aimed at influencing the behavior of a potential student. In this case, the potential recruit is the primary target of recruiting recommendations. However, one might also alter the technical program itself. This in turn may draw in more students while not affecting the substance of the technical education so much as its presentation to potential students. In this case, the technical program is the primary target of recruiting recommendations. The recommendations are meant to change the behavior of the program in the expectation that this will significantly affect the behavior of potential recruits. Finally, one might alter the educational environment within which the technical program exists. By reducing competition for students or altering the relationship between technical programs and other programs, more students might be attracted to technical programs.

Therefore, we present recommendations at three levels. The recommendations are aimed at altering the behavior of individuals, technical programs, or the statewide educational environment. The section having to do with the state educational system is divided into two subsections concerning the K-12 system and the post-secondary system.

Each of the three sections contains three sorts of recommendations. First, there are recommendations for policy action. Second, there are recommendations for research that could result in additional policy actions and the refinement of present policies. Finally, we encountered during the research a number of possibilities for policy action which deserve attention, although there is presently insufficient information upon which to base them. We list these possibilities as experimental recommendations which might be implemented on a small scale to test their viability.

We have included a fourth major section that involves only research recommendations. This section concerns the economic conditions that impact upon student preferences.

I. RECOMMENDATIONS AT THE LEVEL OF THE INDIVIDUAL

A. Policy Recommendations

1. Recruiting efforts should be directed at five sorts of individuals in the following order of priority:
    a. Students about to graduate from junior high school or in their first years of high school.
    b. Adults who have been out of school and want to return.
    c. Students who are about to leave high school.
    d. Students in elementary school.
    e. Students in other sectors of the post-secondary system who are considering the possibility of dropping out.

The efforts should be largely informational for those in the elementary grades. Otherwise, recruitment ought to involve a definite effort to persuade individuals to enter technical programs.

2. Recruiters should make a definite effort to reach those in the adult population who might not typically consider

technical careers, or who might feel as though they are not wanted in the technical professions. These groups certainly include women and members of ethnic minorities. They may also include the physically handicapped, ex-convicts, and Vietnam veterans.

3. Recruiters should make a similar effort with secondary school students to reach those who are not ordinarily in the recruiting pool, including women and members of ethnic minorities. Recruiters should make the entrance requirements to technical programs clear to such groups early in their high school careers so that they know what courses they must take in high school.

4. The form of the recruiting approach should:

   a. Involve a diversity of recruiting techniques (e.g., brochures, television commercials, and personal interviews) rather than depending on a single approach.

   b. Use one-way media (e.g., television, radio, and targeted mailings) for informational purposes, followed by two-way media (e.g., discussion groups and interviews) for persuasion purposes as the best sequence for convincing people to enter technical programs.

   c. Present both sides of any argument concerning the choice to enter a technical program; the presentation should point out both the advantages and disadvantages of entering such programs without biasing the arguments one way or the other.

   d. Allow the potential student to reach his or her own conclusion concerning technical schooling rather than stating at the conclusion of an argument that the person should enter such a program.

5. Technical programs should maintain their recruitment on a continuous basis rather than developing a massive recruiting campaign one year and slacking off the next.

6. The information that potential recruits receive about technical programs should include at some point information on the relative economic benefits of technical education, the ease with which graduates may get jobs, the degree to which they are satisfied with their work, the average and top salaries for technicians, and the possibilities for advancement and promotion in the technical profession. The presentation should be a matter of honest advertising designed to help students

make decisions on the basis of information rather than a glamorized image of the technical profession.

7. Recruiters should make a direct and concerted effort for several years to counter the negative image of technical employment which the recent aerospace and defense lay-offs have caused.

8. Efforts should be made to emphasize the contributions made by engineers to the quality of our life and to portray the possibilities of future contributions.

B. Research Questions

1. Several factors appear to have stigmatized the image of technical programs for potential students. What are the relative effects of the following factors on the images that various groups hold of such programs: the apparent position of the technicians in the technical profession as a whole; the experience of students in high school vocational technical programs; the lumping of technical programs at the community college with other vocational programs; and the perceived difficulty of the programs?

2. There have been few studies that indicate the extent of the adult "market" for technical education. How many adults are potential recruits for technical programs? Under what conditions (e.g., revised class schedules, special services) would the maximum number enroll? What is the interest for technical education among women, blacks, and those contemplating second careers?

3. While something is known about the personality characteristics of technical workers, little exists on the nature of their work experience and their career patterns. What is the nature of this experience? What career patterns characterize persons in these occupations? Is a high service orientation consonant with the formation of technical careers?

C. Experimental Recommendations

1. At least one community college has fielded a major recruiting effort which utilizes students as recruiters. While the expense for training students and mounting such a program could be prohibitive, some variation of the approach could conceivably work on a smaller scale. Schools should not dismiss the recruiting power of students. They know what a program is like from a

different perspective than what potential recruits most often hear.

II. RECOMMENDATIONS AT THE LEVEL OF TECHNICAL PROGRAMS

A. Policy Recommendations

1. Community colleges should develop and implement refresher programs for those adults who want to develop a technical career and have the educational qualifications but need brushing up.

2. Technical programs should make a major effort to treat part-time learners as part of their regular programs instead of isolating them in continuing education programs. This might involve the varied scheduling of classes and the abolition of rules or standards of behavior that tend to treat students only as immature adolescents. It will result in a richer mix of experience in the classroom and improve the learning environment for everyone.

3. To enhance their image, technical programs should associate themselves with schools of engineering wherever possible. This might be in the form of joint courses, a guaranteed transfer into the engineering school if the two-year program is successfully completed, the joint use of facilities, the sharing of faculty, etc.

4. Further legitimation can and should come from community colleges taking the official position that the technical programs are transfer programs which may be terminal, rather than the reverse, and treating the programs accordingly.

5. The technical programs should develop pre-technology programs as part of the overall program in order to improve the mathematical and technical capabilities of students who might not otherwise be qualified for technical education but who have the interest and the potential. These programs should be shared with feeder high schools. The British curricula in applied science and applied mathematics might be used as a model.

6. A state-wide commission should be created to examine the possibilities of consolidating programs and to look into the advantages and disadvantages of encouraging specializations at different institutions. The current system provides the fewest choices to those in rural areas because the colleges are smaller and have fewer programs. A system permitting specialization and developing new mechanisms for allocating students would be more equitable in the long run.

7. Existing efforts to improve articulation with high school and BOCES programs should be expanded. More joint projects, faculty-sharing, and increased flexibility in permitting access to community college programs would be beneficial in a variety of ways. The current experiments with "middle colleges" should be examined with regard to their application to occupational programs.

B. Research Recommendations

1. While there is a groundswell of support for cooperative education, little appears to have been done to evaluate those programs presently in existence. What are the benefits of existing cooperative programs for technical students? Do they appear to attract students to the programs? Do participating students have an easier time with placement? Are there any factors preventing these arrangements on a large scale?

C. Experimental Recommendations

1. Some community colleges might rework their technical programs to give them a high service orientation. This could conceivably allow students to acquire the prestige that is accompanying many of the service professions recently. It would also be consonant with employment trends which go toward an increase in the service sectors and with the apparently increasing preference of many youth for service careers.

2. Special services (e.g., child care or tutoring) appear to attract some students to programs. It would be worthwhile to see if such services can significantly increase the numbers of recruits, particularly those recruits from groups such as women and blacks. On the whole, the approach would be to make it easier for students to take the programs on their terms rather than waiting until they can enter on the terms that the program might set.

3. With the advent of cooperative education, some effort is due to test the possible effects on recruiting of other arrangements tying technical programs to the labor system. This might include the granting of external degrees for technical work and the crediting of technical work done beyond the classroom so that students may gain advanced status in a program and cut down on the time that they must spend in the program itself. Empire State College and the Regents External Degree programs offer mechanisms for such programs.

4. While financial incentives would seem to attract more students to technical programs, it is not clear that the cost would be

worth the final results. The state might support several different types of financial incentives at selected technical programs for several years to determine the efficacy of such approaches.

III. RECOMMENDATIONS AT THE LEVEL OF THE STATE EDUCATIONAL SYSTEM

The K-12 System

A. Policy Recommendations

No recommendations are made.

B. Research Recommendations

1. While something is known about the career development process in children and adolescents, researchers have not directly related this to the sort of social organization or tracking that an educational system employs. What is the extent to which tracking affects the process of career choice such that a significant number of students are systematically excluded from technical education by the time they reach high school graduation?

C. Experimental Recommendations

1. Pre-technology programs at the high school level could increase the number of students who are able to enter technical programs. Yet this is not a certain conclusion, and experimentation on a small scale is called for before considerable expense is risked on any statewide efforts.

The Post-Secondary System

A. Policy Recommendations

1. The state should encourage community colleges to use a diversity of recruiting approaches rather than espousing any particular technique. It should complement such efforts by sponsoring some medium for an interchange of information on recruiting such as a newsletter, workshops, or a central information office.

2. The state should encourage all technical programs within state community colleges to gain the accreditation of the appropriate engineering society that accredits such programs. It is expected that this will increase the legitimation of the programs for potential students.

B. Research Recommendations

1. It is unclear that a diversity of technical programs are needed instead of a single program with electives for different areas of interest. A program that gives students highly generalizable skills may well put such students into a superior employment position. This is not certain, but seems worth exploration. What, then, are the general educational requirements underlying technical education which are not peculiar to a particular technology. To what extent may programs be combined or put on a joint basis?

2. There is a definite and mounting competition between community colleges and four-year schools to win over students. However, the exact extent of the competition and its effects remain unknown. Such research should probably involve the development of a flow analysis of students or adults as they go from high school into the post-secondary system; such a model should be amenable to computer simulation such that by varying program and institutional parameters, some estimation may be made of the numbers of students who would end up in different programs under different conditions.

C. Experimental Recommendations

1. The National Industrial Conference Board in conjunction with the Advertising Council has mounted a massive national advertising campaign to persuade students to enter technical careers. Such an approach is certainly possible on a statewide level through public service announcements. With the number of television stations that this would involve, however, it might be worthwhile to test such advertising in a single locality. Rather than advertising that locality's own technical programs, though, it may simply offer to send information concerning opportunities in technical programs and professions in New York State.

IV. RESEARCH ON THE INSTITUTIONAL ENVIRONMENT

A. The Labor System

1. It is usually assumed that technically trained persons have access to middle- to high-status jobs. What is the actual position of technicians in the labor system? Are they the blue-collar workers of the technical professions? Is there an actual job ladder going from the technicians job to that of the engineer?

2. There is some question about what employers really prefer in the way of technicians. Do they prefer upgraded workers, a

revision of the work organization so that fewer technicians are needed, four-year college graduates who would otherwise be unemployed, or community college graduates?

V. CONCLUSIONS

The above recommendations offer no simple solution to the recruitment problem. Ultimately, each program must assess its own problems, its strengths and weaknesses, and select appropriate strategies. The above shopping list ought to help. It certainly should provide fuel for discussion and debate. This document was intended to serve as a heuristic device and its success in that regard will be measured by the strength of the reactions to it rather than their positive or negative character.

APPENDIX A

A FORECAST OF FUTURE NEED FOR TECHNICIANS

A. Introduction

> If you have a good scientific or technical education, you're all but guaranteed work. Exciting, meaningful work--at double the salary of the average high school graduate.
>
> And you no longer need four years of college to start out on a scientific or technical career.
>
> You can break into any field--from medicine to computers to engineering to the space program--with only a year or two of education. Just become a technician.
>
> --Fourth Edition, "25 Technical Careers You Can Learn in 2 Years or Less."

The above pitch is not a glib set of lines with little substance. It is part of a brochure jointly sponsored by the U.S. Office of Education, the National Industrial Board, and The Manpower Institute. Its preparation was through The Advertising Council. Its promotion came over nationwide public service advertisements on television. Its funding represents the donations of 38 major American companies with a stake in technical manpower.

Since 1969 this "Continue Your Education" campaign has been a way to encourage students to enroll in technical programs.[1] It shows the seriousness with which the business community and the federal government regard what many foresee as a major shortage in technicians.

The concern over technical manpower is not new. It existed during the late 1950's and continued into the 1960's. The concern has not been without some foundation. From 1950 to 1968 the rate of growth for the technical, science, and engineering professions was 6.2%, as compared with 1.2% for the entire civilian labor force.[2]

Even though that rate peaked during the latter 1950's and dropped going into the 1960's, it has not gone much below 3% and has been rising since the latter part of the decade. By 1968 about 3.3% of the labor force was in the technically-oriented professions.

However, the primary concern for technical manpower is now switching from scientists and engineers to concentrate more upon technicians. A recent report on technical manpower from the National Industrial Conference Board brings this out:

> The major focus of technical manpower shortages in the 1960's seems to have shifted from engineers and scientists to technicians. The shortages of the 1950's were largely associated with the crash programs in atomic energy, aerospace, and new weapons systems. While these three areas continue to make heavy demands on technical manpower, shortages of technicians in recent years may have been aggravated by the increasingly pervasive use of the computer and related automation equipment, to the high priority accorded to more and better medical care, and to military production. The apparent shift in emphasis from engineers and scientists to technicians may also reflect, in part, a need and a desire for more efficient utilization of the professionals. As technicians become more plentiful, engineers and scientists can be released from routine duties to devote themselves more fully to activities demanding higher levels of education and experience.[3]

The major concern of this paper is with the possibility of future technician shortages. Its more particular focus is on engineering technicians, a group which in 1966 constituted close to 45% of some 900,000 technicians in America.

The next section therefore concentrates on the national situation. The second section begins to interpret the data in the context of New York State community college technical programs.

B. The National Scene

There have been two major reports in the last three years on the technical manpower situation in America. Both have forecast shortages of technicians, one gearing its figures to 1975 and the other to 1980.

The Bureau of Labor Statistics issued the most recent report in 1970 as Bulletin 1639, "Technician Manpower, 1966-1980." The BLS finds that industries in 1980 will more highly utilize technicians relative to the total labor force. It attributes this probable increase to expansions in research and development activities, the increased complexity of industrial development, and the probable growth of those industries that employ technicians.[4]

The Bureau uses two different premises in determining its forecasts. The first assumes that the sources of technicians apparent in 1965 will remain proportionately the same in 1980, with the future continuing much the same as the past. This results in a shortage of 300,000 technicians up to 1980. Employers would probably have to meet the shortage through upgrading workers. This would raise the original proportion of upgraded workers from 33% of the supply to 50%, a situation which the BLS regards as undesirable.[5]

It consequently switches its premise to take into consideration the trends for graduates of training programs, producing the results shown in Table 1.[6] This premise stresses the training programs alone as a source of new technicians, regarding job upgrading as a stopgap tactic to be used only to alleviate shortages.

Table 1

Prospective Relations Between Requirements for and Supply of Technicians, if Past Patterns of Entry Continue, 1966-80

	Requirements	Supply
Growth	509,000	--
Replacements: Deaths and retirements	150,000	--
Transfers	375,000	--
Preemployment	--	1,020,000
Post-secondary preemployment training	--	750,000
Employer training	--	175,000
MDTA training	--	95,000
Technician-related	--	171,500
College and university (4-year) graduates and dropouts	--	150,000
Armed Forces training	--	21,500
Upgrading required	--	120,000
Sub-Total, Supply	--	1,191,500
Losses resulting from deaths, retirements, and transfers	--	277,500
TOTALS	1,034,00	1,034,000

SOURCE: Bureau of Labor Statistics

The rationale for this is straightforward. In general, employers prefer technicians trained in preemployment technical programs over the upgrading of production workers to technical levels. The BLS therefore interprets the supply of technicians as the aggregate of those emerging from technical programs, and it equates the difference between this supply and the expected demand as the need for job upgrading.

Using this premise, job upgrading drops to 10% of the needed supply while post-secondary preemployment programs rise to about 60%.

A further breakdown of the Bureau's conclusions for the demand for engineering technicians appears in Table 2.[7]

Table 2

Employment of Technicians by Occupational Specialty, Estimated 1966 and Projected 1980 Requirements

Occupation	1966 employment	Project 1980 requirements	Percent increase, 1966-80
Technicians, all occupations	886,900	1,395,700	57.4
Draftsmen	272,300	434,300	59.5
Engineering and physical science technicians	419,300	646,800	54.3
Engineering technicians	299,200	453,800	51.7
Chemical technicians	60,500	96,500	59.5
Physics technicians	10,600	20,700	95.3
Mathematics technicians	5,300	10,100	90.6
Other physical science technicians	43,900	65,700	49.7
Life science technicians	70,000	108,900	55.6
Other technicians	125,100	205,800	64.5

SOURCE: Bureau of Labor Statistics

Although the expected percentage increases are highest for physics and mathematics technicians, the largest numerical gaps appear for draftsmen and engineering technicians. In terms of the training needed to competently assume a technical role, the shortage of engineering technicians may be by far the most serious of those which the table depicts.

The BLS does not further breakdown its figures according to specific sorts of engineering technicians that might be needed. However, it does list the expected requirements for such technicians by industry, allowing one to make rough qualitative estimates of the technical "mix" that the nation will probably need in 1980. The breakdown appears in Table 3.[8]

Table 3

Industry Demand for Engineering Technicians,
Actual (1966) and Projected (1980)

Industry	1966	1980
All industries	299,200	453,800
Mining	1,700	1,800
Petroleum extraction	1,000	1,000
Other mining	700	800
Contract construction	6,100	9,000
Manufacturing	146,900	230,500
Ordnance	11,100	12,000
Food	500	600
Textile and apparel	500	600
Lumber and furniture	800	1,100
Paper	2,100	3,100
Chemicals	6,900	9,600
Petroleum refining	1,900	2,100
Rubber	1,400	2,200
Stone, clay, and glass	1,400	2,200
Primary metals	4,300	5,600
Fabricated metals	5,000	7,100
Machinery	20,800	38,800
Electrical equipment	55,400	96,700
Motor vehicles	7,100	8,800
Aircraft	18,100	24,600
Other transportation equipment	1,400	2,000
Professional and scientific instruments	7,000	11,800
Miscellaneous manufacturing	1,200	1,600
Transportation, communication, and public utilities	38,000	54,200
Railroads	1,300	1,200
Other transportation	1,100	1,600
Telecommunications	17,700	28,300
Radio and television	9,300	12,800
Public utilities	8,600	10,300
Other industries	35,900	54,400
Miscellaneous business services	11,500	16,500
Medical and dental laboratories	--	--
Nonprofit institutions	900	1,900

Table 3 cont.

Industry	1966	1980
Engineering and architectural services	7,600	13,600
Other nonmanufacturing	15,900	22,400
Government	68,500	100,700
Federal	33,600	46,200
State	27,500	43,900
Local	7,400	10,600
Colleges and universities	2,100	3,200

SOURCE: Bureau of Labor Statistics

It is apparent that the greatest need for technicians will be in the manufacturing sector of the economy with "transportation, communication, and public utilities," "government," and "other industries" following with much lesser absolute needs. Those industries least needing technicians seem to be mining, and colleges and universities.

With almost no way to evaluate the job mix for government and the other industries, one may eliminate these sectors from consideration, assuming that their job mix will vary sufficiently to include all varieties of engineering technicians.

Manufacturing presents the clearest picture. "Electrical equipment" will take a large leap in its requirements, quite probably favoring electrical engineers as a consequence. A demand for mechanical engineers for "machinery," aeronautical engineers for "aircraft," and chemical technicians for "chemicals" also seems reasonable.

The expected demand for engineers in "telecommunications" and "radio and television" may well boost the already large demand anticipated for electrical engineers. With the similarities between electrical and electronic engineering, particularly in the curricula which technical programs use for each, the two groups of technicians should also have facility in crossing from one sector to the other.

The plight of civil technicians is uncertain from the breakdown. Contract construction taken jointly with public utilities and other transportation may reflect an increasing demand for such technicians, but the demand does not appear to be very great.

One must take these estimations lightly. Crossovers may occur between different groups of technicians. Civil technicians may find it easy to switch into electrical engineering. Industries may regard an electrical technician as being as good as an electronic technician if an electronic technician is what it needs.

In 1969, the National Industrial Conference Board (NICB) issued the second report, also showing a future manpower shortage. Much of its data is as up-to-date, and in some cases more up-to-date, than that used by the BLS.

The report approaches future supply figures for technicians in a way similar to the second approach of the BLS by assuming that trends for training programs will continue. The NICB uses 1968 as its base year for enrollment figures in training programs. In extrapolating the figures to 1975, it assumes increases of zero to 15% over the base year.[9]

The Board's final figures show an expected shortage of 160,000 to 220,000:[10]

1.	Employment Requirements, 1975:	1,198,000
2.	Employment, Actual, 1968:	968,000
3.	Replacement Needs:	330,000
4.	Growth Needs: (the difference between figures 1 and 2)	230,000

5.	Total Needs: (the sum of figures 3 and 4)	560,000
6.	Supply of New Technicians: (exclusive of upgrading)	340,000 to 400,000
7.	Shortage of Technicians: (equivalent to upgrading needs)	160,000 to 220,000

Presenting other data, the NICB makes additional estimations of a coming shortage:

> Voluntary quit rates offer still further evidence of shortages of technicians and engineers. Quit rates for technicians and engineers in manufacturing in the past decade have been consistently well above the quit rate for all employees in manufacturing. Relatively high quit rates in a particular occupation constitute a rough index of shortages since they reflect the existence of a large number of unfilled jobs in that occupation.[11]

A second indicator is the demand for school-trained technicians. In the year ending June 30, 1968, industrial recruiters reached only 75-80% of their recruiting goals for technicians graduating from two-year technical schools. The figure is slightly lower for four-year technical school graduates and rises to 90% for other schools.

While the recruiting goals are better met for upgraded employees, job trainees, and experienced technicians, a shortage is nevertheless apparent.[12]

Both studies are subject to further qualifications and both make further assumptions in analyzing their data. Exploring these aspects can clarify the uncertain elements in each report. In addition, it may allow a re-interpretation of the manpower situation if one can challenge any of the basic assumptions.

A most obvious element of uncertainty stems from confusion over the "technician" label. The BLS precisely defines the occupation as requiring training comparable to that obtained in a two-year technical institute. But in identifying their technical needs for the future, employers may use a much different definition.[13]

The difficulty extends to the identification of present workers as technicians. For instance, employers may call an employee with two years of technical training an "engineer" for reasons of status. Firms may upgrade those with technician training to the level of engineers. Other situations also may occur. In any event the result is increased uncertainty, particularly so far as the needed number of graduates in the future from technical programs.

In addition, the reports make differing analyses of the ratio of technicians to scientists and engineers. The BLS points out that studies done in the past report employers as expecting and desiring an increase in the ratio, which presently hovers around the 63:100 (technicians to scientists and engineers) level with variations for different economic sectors.[14]

This implies that the ratio is mutable, something which the NICB acts upon by taking into account the trends for the ratio in computing its 1975 demand figures. However, the report is vague on the trends that it expects and it presents no data indicating the effects of ratio changes on the final demand.

On the other hand, the BLS uses a rate of utilization for technicians that remains about the same as at the present. While this ratio may go through changes in the future, the BLS points out that during the 1961-1965 period, when engineers and scientists were in shorter supply and technicians might have been utilized to take up the slack, their employment was still slightly faster than that for technicians. Thus, there was no change in the ratio, suggesting that little pressure actually exists to increase the ratio despite the claims of employers.[15]

Finally, the BLS data bases its forecasts in part on 1966 surveys of technical employment in the United States. The NICB data is slightly more recent. Situations may have changed since that time to cause differences in the expected future. For instance, an overabundance of technicians could cause employers to hire more technicians. A shortage in turn may cause a lesser utilization of technicians and the substitution of other employees in their stead.

This possibility has two aspects. It is conceivable that industries since 1966 have found--or may find--ways to circumvent the most likely situation, a technician shortage. Potentially, different uses of engineers or new organizational methods may reduce the actual need for technicians, alleviating the effects of any shortage. In other words, the alternative of upgrading workers in the face of a shortage may not be the only alternative. Neither upgrading nor any great increase in the numbers of technicians may be needed at all.

At the present, claiming on this basis that a shortage will not exist would be unjustified. A shortage is merely not imperative or met solely by in some way producing more technicians.

The second aspect involves the enrollment figures for technical programs which each report used as part of the base figures for future supply. Changes in the enrollment trends could either aggravate or alleviate a shortage. However, there is insufficient data from the enrollment years following those used in the reports, so that we cannot make an estimation of the long-term enrollment trends for technical schools with any confidence if we are to use these figures alone.

C. Technician Manpower in New York State

One indicator that technical manpower, and technicians, are doing well in New York State is the unemployment rate. While engineering unemployment has soared to over 5% in California and Washington, the President's Manpower Report for 1972 says that the New York figure was 3.2%.[16]

This has more than superficial significance. New York and California are the two top states for professional technical manpower, according to reports issued by the NICB. It appears that even though there is a slump for technical manpower elsewhere, there is still a high demand for such workers in New York.

Making statements about the future situation in the state is more difficult. One complication stems from the fact that manpower needs for technicians are closely connected with those for engineers and scientists. The BLS report, for instance, used estimates of the future demand for scientists and engineers as the base for estimates for the demand for technicians, applying the technician to engineer and scientist ratio to convert one to the other. But the figures for scientists and engineers are most accurately calculated on the national level. The high geographic mobility for the two groups makes disaggregation by state an uncertain exercise. Consequently, forecasts for technicians do not break down well on the state level.

This produces perplexing problems for manpower planning. Technicians as a group have much less mobility than scientists and engineers.[17] They traditionally take jobs in their local areas, and the fact that many of the technicians are trained through community colleges accentuates this. The result is a need for more localized manpower figures when the best available forecasts are exactly the opposite.

Nevertheless, using the premise that the New York economy reflects the national economy, the New York State Department of Labor has used 1968 employment figures to make projections of employment to 1980.[18] These figures appear in Table 6.

Table 6

Number of Jobs and Job Openings, New York State
Estimated 1968 and Projected Requirements 1980 (in thousands)

Technical workers and specialists (excl. medical and dental)	1968	1975	1980	Jobs to be filled 1968-1980			
				Total		Jobs resulting from:	
				Number	Percent of 1968	Industrial change	Deaths and retirements
Draftsmen	28.2	35.1	40.8	16.3	58	12.6	3.7
Structural design technicians and related specialists	3.8	4.5	5.2	1.8	47	1.4	0.4
Electro- and mechanical engineering technicians	51.2	63.9	74.2	27.5	54	23.0	4.5
Mathematics technicians	1.0	1.1	1.2	0.3	30	0.2	0.1
Physical science technicians	12.3	15.1	17.6	7.3	59	5.3	2.0
Industrial engineering technicians	8.4	10.6	12.2	5.1	61	3.8	1.3
Civil engineering and construction technicans	18.5	24.6	29.5	14.1	76	11.0	3.1
Sales and service technicians	2.4	2.7	3.0	1.0	42	0.6	0.4
Technical writing and illustration technicians	4.2	4.9	5.3	1.9	45	1.1	0.8
Safety and sanitation inspectors and related specialists	5.2	6.2	7.2	2.7	52	2.0	0.7
Product testing and inspection specialists	9.5	10.6	11.3	3.3	35	1.8	1.5
Data processing, systems analysis and programming specialists	18.0	25.0	30.0	15.0	83	12.0	3.0
Airway tower specialists and flight dispatchers	1.9	2.7	3.3	1.8	95	1.4	0.4
Broadcasting, motion picture and recording studio specialists	3.2	3.5	3.7	1.0	31	0.5	0.5
Radio operators	4.1	5.0	5.4	2.3	56	1.3	1.0
TOTAL	171.9	215.5	249.9	101.4	59	78.0	23.4

SOURCE: New York State Department of Labor

The similarity to the national scene would seem to imply a consequent similarity to future demand for technicians. Assuming that this is true, there will probably be significant new demands for electrical, electronic and mechanical engineers. The possibilities for aeronautical, chemical and civil engineers are uncertain due to fluctuations in the state economy and lower levels of national demand than for the other three.

From another viewpoint, the state will probably not develop the demand for technicians quite as rapidly as the rest of the nation. DeWitt forecasts an annual rate of increase of 2.5% for professional technical workers in the state from 1968-80. While this is the highest for the occupational groups in the state, it is lower than the national rate of 3.4% for the same period.[19]

The major implication of this is that N.Y.S. may reflect a national technician shortage but is likely to have a situation proportionately less serious in magnitude.

A final and more precise look at the technician situation for the state comes in a comparison of the anticipated demand and supply figures for the state. Table 7 contains the probable yearly demand for 1975 for technical groups, while Table 8 contains the number of technical degrees granted in New York State since 1965-6.

Table 7

New York State Labor Demand Summary, Technical Workers, Current and Projected

Occupations	1970	1971	1975
Draftsmen	1,240	1,290	1,450
Structural design technicians and related specialists	170	180	200
Electro-and mechanical engineering technicians	1,950	2,020	2,280
Mathematics technicians	30	30	30
Physical science technicians	540	560	640
Industrial engineering technicians	340	350	400
Civil engineering and construction technicians	1,040	1,100	1,310
Data processing, systems analysis and programming specialists	500	510	580
Other technical workers	8,800	8,920	8,830

SOURCE: New York State Plan for the Administration of Occupational Education

Table 8

Two-Year Technical Degrees Granted in New York State

(Community College Figures in Parentheses)

Area	1965-66	1966-67	1967-68	1968-69	1969-70
Chemical Technology	145 (97)	170 (107)	126 (81)	138 (85)	127 (119)
Civil Engineering*	542 (241)	521 (223)	501 (228)	515 (168)	571 (345)
Electrical and Electronic Engineering	768 (507)	1077 (490)	955 (493)	1058 (531)	1099 (586)
Industrial Engineering and Technology	139 (11)	203 (75)	138 (21)	135 (9)	158 (42)
Mechanical Engineering and Technology	677 (273)	694 (300)	729 (308)	893 (367)	948 (439)
Other	152 (22)	345 (55)	429 (112)	201 (38)	141 (76)
TOTAL - All Engineering Technology	2488 (1151)	3111 (1250)	2971 (1243)	3004 (1198)	3149 (1607)

SOURCE: Office of Education

*Includes Architecture and Building

Since the labor demand figures and the degree figures involve different schemes for categorizing the technical areas, Tables 7 and 8 cannot easily be compared. Still, it is possible to compare similar categories. For instance, the demand for electrical and mechanical engineers was about 2,020 in 1971 and will be about 2,280 in 1975. The total of degrees granted in these two fields in 1969-70 was 2,047. Similarly, the demand for civil engineering technicians was 1,100, and will be about 1,310, while the supply in 1969-70 was 571. In industrial engineering the figures are 400 and 158.

Although these comparisons are not exact, there are at least three factors which lead to their adjustment. First, it is generally true that only 60 to 70% of those graduating from technical programs go into a job that was related to their training. Using this figure, we may adjust the above figures to more properly represent the actual supply. Second, some people may come into the technical fields although they received degrees in non-technical programs. Third, even if the graduates go into a technical job, they may still leave the state entirely. In this instance, however, the loss of manpower is probably low due to their replacement by other people coming into the state.

With the figures adjusted, the supply from two-year technical programs in New York appears to be about:

Electrical and Mechanical Engineering: 70%
Civil Engineering: 30-35%
Industrial Engineering: 25-30%

It is apparent from these figures that the technical programs in New York are supplying more mechanical and electrical engineering manpower than is true for two-year programs in the rest of the nation. The other areas involve a supply level that is only par compared to the national contribution of 27% from two-year programs.

These estimates are so crude that we can make only very tentative conclusions using them as a basis. First, it would seem that in some major areas, namely electrical and mechanical engineering, the two-year programs are making a major contribution even though they are not supplying all the manpower that is needed. Not all of the New York programs are in this position. Some, such as civil engineering, and perhaps smaller programs such as industrial engineering, are contributing at a level which, although it matches the national average, is nevertheless likely to lead to manpower shortages later on if there is no improvement.

In general, the two-year technical programs in the state seem to be meeting manpower needs more than is generally true of the rest of the nation. From this perspective we make the tentative conclusion that a national manpower shortage, if one should occur, will not be as severe in New York as elsewhere.

Footnotes to Technical Manpower Section

1. Rhine and Creamer, p. 6.
2. These and other general statistics regarding technicians can be found in Rhine and Creamer, pp. 11-28.
3. Rhine and Creamer, p. 5-6
4. BLS, p. 1.
5. The premises and the possibility of a shortage using different premises is discussed in BLS, pp. 11-12.
6. Table 1 is compiled from figures presented by the BLS, p. 12.
7. Table 2 is reproduced from a BLS table, p. 7.
8. Table 3 is a compilation of tables from BLS, pp. 20-22.
9. This and other technician supply considerations are discussed in Rhine and Creamer, pp. 67-69.
10. These figures appear in Rhine, p. 59.
11. Rhine and Creamer, p. 10.
12. Rhine and Creamer, p. 56.
13. The BLS report discusses this and other qualifications to a greater extent on pp. 13-18.
14. BLS, p. 13.
15. BLS, p. 13.
16. 1972 Manpower Report, p. 122.
17. Rhine and Creamer, p. 27.
18. Table 6 is taken from a table appearing in the New York State Department of Labor study, pp. 71-2.

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APPENDIX B

ANALYSIS OF SUNY ENROLLMENTS BY TYPE OF COLLEGE 1968-71

A. Introduction

Poor recruiting efforts by a community college constitute only one of a number of explanations for falling or apparently stagnating enrollments in technical programs. A variety of other causes could produce the same results. An overall decrease in the school-age population, for instance, could lead to a consequent decrease in those students attending community colleges. Technical programs would reflect the decrease along with the rest of the educational system. Educational policy can do nothing to directly counter such population drops. Poor enrollments in a single program could also stem from competition from other educational programs recruiting from the same pool of potential clients. Educational policy at the regional, state, or national level may alleviate enrollment problems stemming from such causes by regulating the competition.

Finally, saturated market conditions may limit the amount of enrollment growth for a technical program. That is, given a specific recruiting approach aimed at a given population for a given technical program, intensifying the efforts will not result in an increase in enrollment. The program may have all the students it can get under those conditions. Three sorts of policies may counter this condition. First, the recruiting approach may be revised or directed toward new target populations, such as blacks, women, or adults in the work force. Second, the program itself may be renovated so that it attracts a new set of students. Each of these policies has as its goal an expansion of the market. The third approach would be to increase the program's share of target populations in the existing market via new approaches to recruiting such as earlier entry for high school students, advanced placement, increased financial aid, etc. This latter option might mean an increase in competition among sectors of SUNY or a restructuring of the SUNY system. Such policies aim to regulate the flow of students through the SUNY system and rest on criteria other than manpower needs or client interests. The issues involved in such allocative policies (who goes where?) are beyond the scope of this paper.

In deciding which sorts of policies are appropriate for any given situation, we must ask at least four questions:

1. What is the extent of the competition among community colleges for students?

2. What is the extent of the competition for students between community colleges and other two-year technical programs?

3. What is the extent of the competition between community colleges and four-year programs for students?

4. What are the apparent market conditions governing the numbers of students who might enter any one of the above three sorts of programs?

In approaching these questions in the case of New York State, we have devised five tables that provide varying perspectives on the enrollment situation from the fall, 1968, to the fall, 1971. We chose enrollment figures over degree figures as the more likely indicator of competitive and market conditions for two reasons. First, students receive their degrees at least two to four years after they make the decision to enter a technically-oriented two or four-year program. Therefore, the degree figures lag in time behind the actual market and competitive conditions. Second, the attrition of students during a degree program affects the number of degrees received. Yet, a program that is particularly good at attracting students may not appear as such if for one reason or another it has a high rate of attrition.

Table 1 presents the total enrollments for community college technical programs in addition to the figures for selected programs in specific technologies.

Tables 2 and 3 present the enrollments per program and the percentage of community college enrollments within SUNY for the selected technical fields, respectively. Tables 4 and 5 follow a similar format in reporting the same sorts of figures for all two-year programs within SUNY and for four-year engineering enrollments in SUNY, respectively.

We may use these tables for addressing the above four questions in the following manner. A comparison of the average yearly enrollment per program and the number of programs in a given year in Table 2 with the enrollment trends derived from Table 1 give us an estimate of the competition among community colleges for students. A comparison of Tables 1, 3 and 4 yields an estimate of the competition between community colleges and other two-year programs in the SUNY system. Analysis of Table 5 and Table 1 gives an estimate of the competition between community colleges and four-year programs in technical fields.

B. Caveats

1. The tables present enrollment figures only over a four-year period. No enrollment figures are available for the period preceding 1968. Therefore, we do not presume to make any long-term analyses of enrollment trends. Such analyses are also not within the scope of this paper, which is concerned with recent market and competitive conditions and not the emergence of these conditions or the forecasting of future conditions. A more extensive study might well include such an analysis if it can overcome the difficulty of employing degree figures that are available from 1967 to 1970. For instance, a preliminary tabulation of degree figures for electrical engineering programs in the mid-1960's seems to give a strong indication that community colleges lost a share of growing enrollments by waiting too long before instituting new programs. Such conclusions may be highly instructive in developing educational policies to improve the response of public education to market conditions.

2. The available figures do not include the fall, 1972, enrollments. These may portend radical changes from the pattern of the previous four years. However, even if such changes were apparent, we would need several more years of figures to ascertain whether the changes are long-term trends that require new policies or transient deviations that need no policies at all.

3. The analysis does not pretend to account for externalities that may change the enrollment situation completely. For instance, the recent pickup in the employment of engineers may mean increased numbers of students reacting to economic incentives and giving renewed consideration to technical careers.

4. The analysis also does not pretend to account for proprietary and correspondence schools that may attract students away from the SUNY system. There is only one accredited school of this variety in New York that could be competitive with the two-year technical programs within SUNY. However, any number of unaccredited institutions may be having a significant effect. Figures for some estimation of this effect are simply not available at this time.

5. The analysis employs enrollment figures that are cumulative. They include full-time, part-time, first-year and second-year students. We can justify the use of such figures if we view the capacity of community colleges to retain their students as an indicator of their attractiveness in a competitive market. A better indicator would be the number of students who first enrolled in a program for any given year. These figures are not available at this time.

6. The inconsistent reporting of enrollment figures by schools to the SUNY Office of Institutional Research makes the accuracy of the figures uncertain. Programs that are dissimilar may appear as part of the same technological area. Programs that are the same may have different titles. For instance, one school lumped its enrollments for electrical engineering in with computer science for two years while reporting the enrollments as electrical engineering for two other years.

7. Four-year programs are typically in universities in circumstances such that the student first spends two years in a general curriculum and then goes into a specific area. This means that the figures for four-year programs must be adjusted for a two-year lag if they are to be compared with figures for two-year programs. For instance, the 1970 figures for four-year schools should be compared most properly with the 1968 figures for two-year schools. Further undermining the value of comparisons is the fact that students in their first two years at a four-year school may decide either to enter a technical field or to abandon technically-oriented ambitions. Moreover, within engineering there is considerable movement across different specializations during the four years, in response to changing market conditions.

8. We assume in the analysis that, in a competitive situation between the different educational sectors, the student who wants to go into a technical area at a community college will choose the same area if he decides instead to go to a four-year or other two-year program. Obviously, this makes the interpretation of any comparisons more problematic. Short of a major research effort to follow individuals through school, this highly questionable assumption or a similar one is necessary for any analysis at all to occur.

C. Analysis

Growth Fields: Data Processing and Health

This paper is not primarily concerned with programs in data processing and health except that recruiting has not been a problem in these areas. It is this factor that makes the consideration of them instructive. It clarifies the characteristics of programs for which recruiting is not problematic.

From Table 1 it is clear that enrollments have steadily risen for both programs in the aggregate sense. Furthermore, a look at Table 2 reveals that both the number of programs and the average number of students per program has also mounted. There appears to be a low level of competition among the community colleges for enrollees.

In Table 4 we see that the enrollments for other two-year programs within the SUNY system have been fairly stable. There seems to be little significant competition between the two sectors. Certainly, what competition exists is not to the detriment of the community colleges.

In Table 5 we see that health enrollments in four-year SUNY colleges have doubled over a four-year period (the figures for data processing were not tabulated). Hence, whatever competition the community colleges have in this sector must come from the four-year schools.

Finally, Table 3 in conjunction with 4 and 5 show that the market for data processing and health programs seems to be expanding in both cases. In each case, community colleges are capturing a greater portion of the market as the years pass. That this expansion is moving slower in the case of the health programs may be due to some competition from other two-year programs, which also show increases.

In general, then, the growth programs for community colleges seem to be characterized by a low level of competition in which a one-student gain for a community college program is not a one-student loss for some other program. In other words, the situation does not appear to be a zero-sum game with fixed rewards. These conditions of course require an expanding market for the services provided by the programs.

A Stagnating Field: Chemical Technology

At the other pole are those fields which are stagnating. Characteristic of such fields is chemical technology. First, enrollments are going down for community colleges, other two-year programs and four-year programs. Second, the progression of stagnation for the community college programs seems to follow a several-step process that involves a drop in average enrollments and the attrition of weaker programs followed by a slight rise in the average enrollment. Presumably, this will either repeat itself until chemical technology is completely phased out or until the enrollments stabilize at some level below which they cannot go for one reason or another.

Third, there appears to be no significant competition between the different educational sectors. Table 3 shows community colleges with a stable share of the market for the two-year programs. In all, then, we conclude that there is little competition among chemical technology programs, that the overall market demand is falling, and that the market position of community colleges is remaining roughly the same.

Civil, Electrical and Mechanical Engineering

Overall, the enrollments for two-year technical programs in New York have risen. There has been a steady progression from 16,438 enrollees in 1968 to 20,714 in 1971. However, we may account for a goodly proportion of this rise by noting the increase of students in data processing programs over the same period. That the rise may be limited to a few programs prompts a look at the enrollments in three technologies which are staples among technical programs: civil, electrical and mechanical engineering.

Electrical engineering is the closest to a growth field among the three. Enrollments for community college programs have gone up rapidly. But the rise did not occur in other two-year programs. For four-year schools, the pattern is erratic, rising over a three-year period and suddenly dropping to a four-year low. This might indicate a competitive surge from other sectors in 1969. Indeed, community college programs did gain a large number of students in this year. However, the community college rise is much greater than the drop in four-year enrollments so that it is not a case of zero-sum competition with the community colleges robbing students from four-year schools. The community colleges would necessarily have had to have recruited some, if not most, of their students from elsewhere.

Overall, then, there appears to be little competition between the community colleges and the other sectors. There also appears to be little apparent competition among the community colleges themselves. Both the numbers of programs and the average number of students per program has risen in what seems to be a reverse of the stagnation progression: the average number goes up, new programs are added, dropping the average, and then the average begins to rise again.

The existence of such a progression suggests that, while the market demand for electrical engineering is high among potential students, it is not as high as that for health fields and data processing. To a limited extent, the addition of one student in a new program may result in the decrease of one student in an older program. Nevertheless, the market demands seem to be rising, at least for community college programs. Consequently, community colleges are slowly increasing their share of the market for two-year programs, as is apparent in Table 3.

Civil and mechanical engineering programs in community colleges do not exhibit the same growth pattern as electrical engineering does. Enrollment levels have been fairly constant for civil engineering while those for mechanical engineering dropped for two years and only recently have regained the 1968 level. The stable character of these enrollments carries over into the four-year and other two-year programs, both of which have experienced constant levels or slight declines. The exception is civil engineering in four-year schools, which dropped and then rose.

The situation indicates that there has been little competition between the different educational sectors, and that one sector has been showing gains while the others show losses. Even in the case of the four-year civil engineering programs, the gain shown in 1971 does not correspond with losses in two-year programs.

What sharply distinguishes mechanical and civil engineering from electrical engineering, however, is the competition between the different community colleges for students. This comes out in Table 2. Average enrollments for both programs have steadily gone down while the number of programs for each has steadily gone up. Clearly, the community colleges are gaining few new students by adding new programs. They seem only to be re-dividing students who would have come into the programs anyway.

It would appear at this point that the recruiting problems which mechanical and civil engineering programs seem to be experiencing are not properly problems of recruiting so much as they are problems of institutional expansion at a time when the market demand is not expanding. Of course, recruiting tactics may prove ameliorative. But a more direct solution would be to stop the addition of new programs and to consider a reduction in the number of existing programs. Certainly, too, the onus for recruiting problems cannot be put on other educational sectors which seem to be robbing the programs of students. In fact, community colleges are slowly increasing their share of the student body for two-year programs.

A Mini-Boom: Industrial Technology

Although there has been an increase in technology enrollments for the 1968-71 period only two of the traditional technological fields--electrical and industrial engineering--seem to be making a significant contribution to this growth. Enrollments in industrial technology programs have generally been low, making their contribution to enrollment increases that are much more significant, hence these programs merit special attention.

For community colleges, the enrollments for industrial technology programs have more than doubled in a four-year period. At the same time, figures for four-year programs have shown definite and significant increases. Even though other two-year programs have not registered such increases, what has appeared is sufficient grounds to investigate the enternalities that make industrial technology of increasing attractiveness.

From the total enrollment figures arrayed in the table, there appears to be little competition between the different sectors. Some competition among community colleges is more pronounced, and increases in both the numbers of programs and the average number of students per program follow the stepped progression mentioned earlier. However, the average figures are not rising to a certain level, dropping as new programs appear, and rising to the same level again. Rather, the average is going higher, indicating that the market demand for the programs is outstripping the rate at which they can be implemented. The rise of community college programs over other two-year programs reflects itself in the 15% rise of the community colleges' share of two-year enrollees.

D. Conclusions

We conclude with some general and tentative answers to the four questions posed in the first section.

1. Competition among community colleges. The competition is generally the stiffest here, particularly in some traditional technological fields where the market demands for potential students do not match the addition of new programs. Electrical and industrial engineering are exceptions.

2. Competition between community colleges and other two-year programs. Although we cannot estimate the impact of two-year programs outside the SUNY system, it seems clear that two-year SUNY programs, outside the community colleges, have not provided the community colleges with any competition serious enough to take students away. Two-year programs have largely held their own in the absolute number of enrollments while losing ground in their share of the total enrollments.

3. Competition between community colleges and four-year programs. There appears to be negligible competition. What gains and losses the four-year sector has experienced are matched by those of the community colleges. This suggests an intervening element, such as changes in manpower needs, which affects the program enrollments more than recruiting competition.

4. Market conditions. The fastest growing demand for education in an engineering technology appears for data processing. Electrical and industrial engineering also seem to have a rising market demand, but it is not rising so rapidly that it offsets the competition between old and new programs for students. The demand for civil and mechanical engineering seems largely stable, so that the competitive situation between the community colleges for students has intensified.

Table 1

Enrollments in Two-Year Community College Technical Programs, New York State

Area	Fall, 1968	Fall, 1969	Fall, 1970	Fall, 1971
Data Processing	1,938	2,550	3,134	3,678
Chemical Technology	666	610	479	474
Civil Engineering	1,057	1,075	1,039	1,115
Electrical and Electronic Engineering*	2,690	2,972	3,043	3,512
Health-Related	6,989	8,219	10,352	13,454
Industrial Engineering and Technology	252	294	347	535
Mechanical Engineering and Technology	2,336	2,284	2,196	2,314

SOURCE: Enrollment by Academic Programs, Fall, 1968 through 1971. Report No. 33, Office of Institutional Research, SUNY, Albany, 1972.

* Figures exclude Queensboro Community College due to irregular reporting.

Table 2

Average Enrollments per Program for Two-Year Community College Technical Programs, New York State

Area	Fall, 1968	Fall, 1969	Fall, 1970	Fall, 1971
Data Processing	121.1(16)*	141.7(18)	164.9(19)	159.9(23)
Chemical Technology	60.5(11)	55.5(11)	43.5(11)	52.7 (9)
Civil Engineering	132.1 (8)	134.4 (8)	115.4 (9)	101.4(11)
Electrical and Electronic Engineering**	134.5(20)	141.5(21)	132.3(23)	135.1(26)
Health-Related	98.4(71)	104.0(79)	120.4(86)	147.8(91)
Industrial Engineering and Technology	42.0 (6)	49.0 (6)	43.4 (8)	59.4 (9)
Mechanical Engineering and Technology	116.8(20)	114.2(20)	104.6(21)	96.4(24)

SOURCE: Office of Institutional Research, SUNY.

* Parentheses indicate the number of programs.

** Figures exclude Queensboro Community College due to irregular reporting.

Table 3

Enrollments in Two-Year Community College Technical Programs as a Percent of All SUNY Two-Year Enrollments for Technical Programs, New York State

Area	Fall, 1968	Fall, 1969	Fall, 1970	Fall, 1971
Data Processing	76.9	77.5	79.1	83.9
Chemical Technology	91.5	90.1	87.6	90.6
Civil Engineering	86.4	86.3	88.4	89.4
Electrical and Electronic Engineering	84.2	84.1	85.6	86.9
Health-Related	86.1	86.3	86.6	88.2
Industrial Engineering and Technology	71.6	81.0	85.9	85.5
Mechanical Engineering and Technology	82.7	83.6	83.2	83.7

SOURCE: Office of Institutional Research, SUNY.

*Figures exclude Queensboro Community College due to irregular reporting.

Table 4

Enrollments in Two-Year Non-Community College Technical Programs, New York State

Area	Fall, 1968	Fall, 1969	Fall, 1970	Fall, 1971
Data Processing	583	740	826	704
Chemical Technology	62	67	68	49
Civil Engineering	171	171	137	132
Electrical and Electronic Engineering	504	560	512	530
Health-Related	1,130	1,301	1,601	1,796
Industrial Engineering and Technology	100	69	57	91
Mechanical Engineering and Technology	490	449	443	452
TOTAL All Engineering Technology*	16,438	17,831	19,013	20,714

SOURCE: Office of Institutional Research, SUNY.

* Includes figures for community colleges as well.

Table 5

Enrollments in Four-Year SUNY Engineering Programs, New York State

Area	Fall, 1968	Fall, 1969	Fall, 1970	Fall, 1971
Data Processing	not tabulated			
Chemical Technology	87	64	59	60
Civil Engineering	150	122	116	150
Electrical and Electronic Engineering	581	616	652	544
Engineering Science	1,073	804	515	397
Health-Related (non-engineering)	1,565	1,697	2,070	3,332
Industrial Engineering and Technology	54	128	268	316
Mechanical Engineering and Technology	172	153	145	108
TOTAL All Engineering*	3,446	3,171	3,004	2,814

SOURCE: Office of Institutional Research, SUNY.

* Figures include programs not listed under the above areas.

APPENDIX C

A REVIEW OF FACTORS AFFECTING RECRUITMENT INTO POST-SECONDARY TECHNICAL EDUCATION

by

Gary Gappert

A. Introduction

It has been said that there is a present and growing shortage of technicians in the United States. Miller and Twyman note that "engineering and technician training programs are graduating less than half of the nation's annual manpower needs."[1] The National Industrial Conference Board (1969) projected the shortage up to 1975. The Bureau of Labor Statistics (Bulletin No. 1963, in 1970) has projected this shortage to 1980.[2]

It was assumed during the 1960's that these shortages could best be met through pre-employment training programs that consist of two years of post-secondary technical education, rather than through the upgrading of older skilled workers, or the downgrading of four or five-year engineering degree holders.[3] The recruitment of high school graduates into these programs has been a problem of high concern.

Equally important is their retention in these programs since Miller and Twyman report that the national drop-out average of two-year technical institute students is approximately 30%. If almost one out of every three recruits drops out before finishing his program, approximately 140 students must be recruited to provide a yield of 100 tech-ed graduates. Of slightly less concern is the subsequent recruitment of these graduates into technician jobs rather than their absorption into 4 or 5-year engineering degree programs.

In this paper we review some of the simple conclusions provided by the literature on economic models of occupational choice. After reviewing some research results on rate-of-return-type studies, we examine a different model proposed by Michelson which is more concerned with the probabilities and expectations associated with reaching particular levels of income. After looking at some other research results having to do with vocational education, we present an outline of a simple model. Alternative scenarios of recruitment are sketched. Finally, some remaining research needs are presented and some policy conclusions offered.

This paper contains no general thesis or hypothesis. Instead, following a general review of the conventional wisdom pertinent to technical education, conclusions are formulated which suggest (1) that the socio-economic correlates of technical education need to be more adequately defined and examined, and (2) that the aspiration-formation process among the children of affluence may be inhibiting or distorting career and educational choices (as viewed from the perspective of manpower planners and technical educators).

B. The Economic Model of Occupational Choice: A Literature Review

Adam Smith summarized his theory of the labor market by noting that: "Every man's interest would prompt him to seek the advantageous and to shun the disadvantageous employment."[4] He went on to refer to "the whole of the advantages and disadvantages" in any form of employment. He and those economists who followed him in the development of classical economics elaborated those causes of advantage and disadvantage. Wages, if operating in free markets, would vary with the ease or hardship of the employment, with its cleanliness or dirtiness, with its honor and status, with the ease or difficulty of the learning required, with its security of tenure and with the probability of its leading to other financial successes. Of course, the classical economists also knew that many real world markets were not always free. Barriers to entry often existed so that labor could not easily flow from low advantage and low wage employments to high advantage and high wage employments. Similarly, natural skill requirements for certain occupations insured an almost permanent barrier to certain employments, which would remain high wage and high advantages occupations. In these occupations the wages reflect a genuine scarcity price.

In general it is agreed that the economic theory of the labor market is logically defensible and gives good predictive results, provided that allowance is made for the time necessary for the allocation process, including the dissemination of information, to work itself out.[5]

If it is said that there is a shortage in some occupation, and if this occupation is not possessed with undue disadvantages of risk to life or health, it is to be anticipated that wages in that occupation will be rising sufficiently to attract recruits. It also should be anticipated that other benefits to those in these occupations will likewise be increasing. These might be benefits which are controlled by the employer, such as working conditions, or they might be benefits such as social status, which are only conferred by the society.

In a time when most if not all wages and salaries are rising, it is not easily perceivable whether wages in the so-called shortage occupations are rising as rapidly as they should. It is difficult to determine from most nationally reported data how post-secondary technicians are faring. Are they to be found among the blue-collar occupations which are defined as "craftsmen, foremen and kindred workers?" Or in the white collar occupations defined as "professional, technical and kindred workers" (where they might be aggregated with engineering degree holders)? Sackley and Gavett found that the annual compound rate of growth of median wages or salary incomes from 1964-69 was 6.0% for craftsmen, *et*. *al*., and 7.1% for professional workers, *et*. *al*. But it was 6.8% for "laborers" and 6.3% for sales workers and 7.8% for "managers, officials and proprietors."[6]

Another reporting difficulty arises because advocates of technical education at the junior college level tend to compare junior college technicians with unskilled or semi-skilled high school graduates and not with high school graduates in skilled blue-collar jobs. They also tend to report earnings at entry level or after about 5 years experience without comparing these earnings with the entry level or longevity earnings of engineering graduates. In the language of Norman Harris, it is said that "at these differentials it does not take long to recover the expenses of a junior college education and to forge ahead of one's contemporaries who ended their education with high school.[7] It appears as if this kind of analysis assumes that the appropriate peer reference group are those high school students enrolled in a general studies curriculum. It might be more appropriate to compare the prospects in technical education with the situation in skilled blue-collar jobs on the one hand and with engineering graduates on the other. It is these categories of employment which require the same mathematical-mechanical aptitude and ability characteristic of technician positions.

It is unclear from these kinds of reports whether the data really reflect a disproportionate increase in starting salaries and earnings sufficient to conclude that a genuine shortage of technicians actually exists. A perceived shortage might exist if firms wish to hire more technicians at the prevailing past wage or salary for those occupations.

The accepted analysis of shortage in selected occupations was developed by W. Lee Hansen. In a paper in The Journal of Human Resources he defined some of the issues in the discussion of shortages in scientific and engineering manpower.[8] He writes that:

> A shortage condition is said to exist if (1) recruitment is difficult, (2) ...salaries are rising above the rates employers feel should be paid, and (3) engineers cannot be assigned to all the jobs which management traditionally gives them.

Hansen is critical of the "informational approach" which is his terminology for the use of supply and demand projections. He indicates that:

> One of the major shortcomings of projections is that they only focus on quantity variables. Changes in relative wage levels or in the relative cost and returns of alternative occupational choices or occupational transfers are assumed to be of no importance or, barring that, too long in coming to make any real difference.

He goes on to define an analytical approach (see Addendum II). After reviewing economic studies which look at the market response to shortages in terms of (a) relative earning gains in particular occupations and (b) starting salaries, Hansen goes on to define a rate of return analysis which considers education as a portion of human capital formation. As he describes it:

> The rate of return approach consists of finding that rate of discount which equates the present value of the costs (direct, plus income foregone) of education required for entry into an occupation with the present value of the incremental earnings stream yielded by the education.

Thus, he continues:

> In a single measure, both costs and returns can be conveniently summarized; the rate of return for one type of education or training can then be compared with those for alternative occupations. Furthermore, shifts in rates of return over time can then be compared to indicate the interplay of changes in both costs and returns, in affecting the net monetary advantages of choosing one occupation over another.

However, he also states:

> Use of this approach must be further qualified so as to indicate that, while a number of factors are influential in occupational choice, decisions will, on the margin, be determined by rate of return considerations, vague though the individual decision-maker's knowledge of these rates may be.

As developed by Hansen and others, the rate-of-return approach to investment in education is based upon the projection of observed earnings as a stream of benefits achieved as the result of a personal (or social) investment consisting of the cost of the education and including foregone earnings. The rate of return to the investment is defined as that interest rate which will equalize the present value of the stream of costs during the learning period to the stream of benefits accrued over the rest of the working life of the individual.

This approach solves for r in the equation

$$\sum_{a=1}^{m} \frac{(B-C)_a}{(1+r)\ 1^a} = 0$$

where B = annual benefits; C = annual costs; and r = internal rate of return. The benefits of the post-secondary investment should include incremental lifetime earnings stemming from (1) higher starting salaries, (2) higher rates of annual income growth, and (3) higher rates of labor force participation and regularity of employment.

From the array of articles published in professional journals, it generally seems to be agreed that the rate of return approach is the most significant analytical tool in assessing the potential return to educational investment. At the same time, certain difficulties do exist in relying upon the rate-of-return type of analysis, especially if it is used to predict human choice in a manner analogous to investment behavior with respect to physical and financial capital.

Some particular difficulties can be cited. First, there are more psychological barriers to human capital investment. Uncertainty about returns in the labor market and unwillingness to assume a financial liability (student or family loans) are two that are commonly cited. Second, the cost components of rate of return analysis are based upon relatively current data projected only a few years ahead, but data for the stream are derived from current earnings projected 20 or 40 years into the future. Third, data determined from aggregate U.S. reported occupation earnings hide variations in regional or sub-sector labor market conditions facing minorities, women, etc. At the same time, data generated from specific cohort groups or labor markets cannot be easily assumed to hold for other cohorts or in other areas.

Fourth, higher rates of return to educational investment in specific occupations may signal to the educational planner and to the student investor the direction in which human resources should be invested, but it gives no indication of what an equilibrium compensation rate should or will be. Neither does it indicate whether institutional barriers will restrict or inhibit the movement of human resources from one choice sequence to another. Fifth, a variation of rate-of-return analysis uses various arbitrary discount rates to generate alternative present values of projected income streams. Although this variation helps to focus on the lumpsum economic resultant of occupation choice, it also obscures alternative perceptions of economic gain and loss. Finally, of course, economic modeling of occupation choice excludes non-economic considerations of occupation choice.

C. Research Results on Rate of Return

In spite of the difficulties and limitations of rate-of-return analysis, it is useful to cite some research results. Becker, in studying adjusted earnings data of persons with varying amounts of education, calculated a private rate of return to education on the order of 10 to 13%. Hansen evaluated the return to several increments of schooling, some of which were terminated before a degree was granted. His study, based upon a 1949 cohort, found a rate of return for two years of a four-year college program to be 5.4%.[8]

Carrol and Ihnen reported the return to graduates of a single post-secondary, two-year technical school in North Carolina.[9] They tested the labor market performance of a small number of the post-secondary technical school graduates against a cohort group of high school graduates who did not continue their schooling. They estimated the rate of return to be between 16.5 and 26% (for those whose education was partially subsidized). The former figure was the estimated figure for return to average total (public and private) investment in the tech-ed graduate. However, since earnings of tech-ed graduates ranged from $289 to $833 monthly, the "average" rate-of-return figure obviously does not reflect this variability in return to investment in education. In another manipulation of their data, Carrol and Ihnen assumed a ceiling on income advantages to tech-ed graduates and that reduced the average rate of return to 11.7%. This 25% reduction in return rate illustrates how sensitive rate-of-return analysis is to the assumption of projected benefits.

Heineman and Sussna analyzed the expected rate of return for the investment in the graduates of a community college in Allegheny County (Pittsburgh) and found it to be 18% for all private and public costs of their junior college graduates. Their results, however, were based upon employment data for 1967 (a war-time full employment year) and income growth rates for 1950-60 applied to 1963 starting salaries.[11]

Other studies more closely examine the experience in specific occupational fields, especially with regard to private choices. Schweitzer, for instance, in a study of high school graduates versus high school drop-outs, reports that while the average return to graduation was indeed high, this general truth was not true for specific occupations. Using median incomes rather than mean incomes (because in most cases the distribution is skewed upwards reflecting median incomes smaller than the mean), they found for some occupations "income increments attributable to high school graduation are negative for both races." Occupations cited included, for instance, truck and tractor drivers, linemen and service repairmen, compositors, typesetters and electricians.[12]

These results may suggest that if a lack of a diploma is not a barrier to entry, potential recruits to some occupations fare better if they enter the work force earlier, especially if they can anticipate only earning median and not mean income in some occupations requiring a high school diploma. Alternatively it may be that the particular occupations which were studied "cream" the best of the high school drop-outs. They also manipulated their data with a higher discount rate (10%), so as to further devalue earnings which reach a profile peak later in life. This rendered negative the return to the fourth year of high school for such occupations as "airplane mechanics" and "tool and diemakers." By their use of 1959 earnings data for males from 18 to 64 years of age, however, they are unable to adequately compare the projected earnings of future diploma-less workers in the decades ahead with the historical experience of past diploma-less workers entering and rising in the labor market from 1915 to 1959.

In a somewhat similar vein are the research results of Carrol and Parry. They investigated what they called the "rationality" of a person staying in school when certain occupations requiring less education also pay well. Deducting direct and entry costs and using a 5% discount rate, they determined discounted net lifetime earnings for 67 occupations. They found that "certain blue-collar fields surpassed some of the professional and managerial occupations." They comment that "some of the so-called shortage occupations" are among the "lowest paid occupations." They cite medical and dental technicians and state and local government administrators in particular. They calculate that foregoing higher education in some cases would result in a higher lifetime return if the costs involved including family support payments were invested in normal investment outlets and not in human capital formation. They also suggest incidentally that lifetime earnings can also be reasonably high for the person who begins with a skilled blue-collar job and must switch in mid-years to a lower paid service position.[13]

These latter kinds of disaggregated studies drawing upon earnings data in specific occupations suggest that rate-of-return type studies drawing upon average earnings to graduates from different levels of schooling belie the reality of variability between different types of graduates headed for different occupations with different earning profiles. It may be that over-investment in education for some occupations is a "felt" or perceivable reality. These occupations require that additional years be spent acquiring a credential as opposed to additional skills.

D. A Different Model

A different type of analysis is offered by Michelson.[14] He observes that the "average earnings of persons in an occupation do not represent expected earnings of people entering the occupation." This is a result of the fact that average earnings are often calculated as a result of observing only "successes" despite the fact that new entrants or recruits to that occupation may not be successes. Expected earnings of new recruits must also consider the earnings of those who fail to become successes or graduates of that field. In a similar way, the average earnings should also consider the earnings of those who transfer upwards into other occupations.

Michelson expresses this in a simple formula for the expected earnings at some future time for a new recruit into an occupation. This is

$$E(Y) = Y_i \; P_i$$

where $\underline{E}(Y)$ = expected earnings

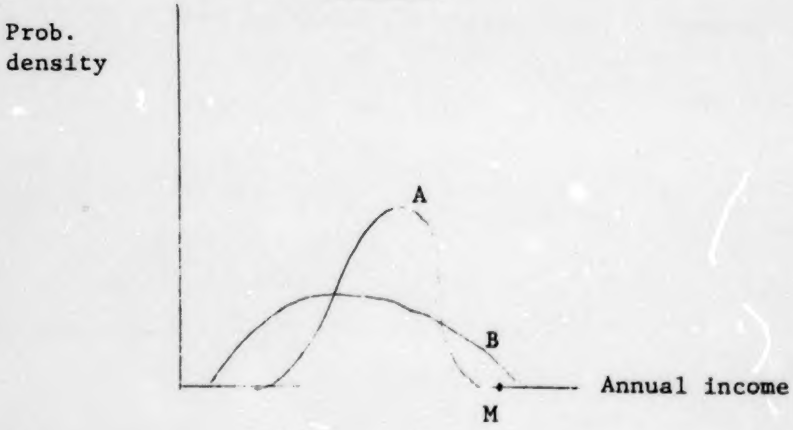
Y_i = average income in occupation i

P_i = probability of being in occupation i

Michelson uses this formula with 1962 data to show that expected earnings often diverge from median earnings. He notes, for instance, that the expected earnings of beginning "retail salesmen" are higher than expected earnings of beginning "craftsmen," even though the median earnings of eventual craftsmen are more than 60% higher than those of eventual retail salesmen. In general, expected earnings for those in some lower paying occupations can be higher than the income of those who stay since some will move up and out.

This may also be dependent upon the shape of income distribution. We can consider income distributions A and B in figure I.

Figure I



"Expected" earnings may be higher in occupation B since some entrants will expect earnings closer to the skewed upper end of the income distribution of occupation B.

Michelson goes on to formulate what he calls a "rational" choice model in which people who aim for higher incomes will enter occupations in which high incomes occur or result, even if most people in that occupation earn considerably less. Instead of following a decision rule which operates so as to maximize lifetime income or rate of return, they follow a decision rule which operates to maximize the probability of achieving an income higher than a particular level. Obviously, there is a very low probability of achieving an income higher than that target level in an occupation which does not have any income exceeding that level (say, level M in figure I).

Michelson relates this decision role with a "strategy of education." He postulates that variations in earnings are explained by labor market characteristics of two types. The first type, called Z characteristics, are those not subject to deliberate change (sex, age, height, etc.). Those which can be affected by deliberate choice are called S characteristics, and include education, training, experience, regional location, etc. The term strategy denotes the choice to acquire S_i characteristics where i are the desired characteristics. He notes that:

> Even if it is found that in the long run people continually choose an S_i which on average leaves them with less income than would some other possible strategy, S_j, it may be the decisions were appropriately made from facts in hand on some basis other than maximizing expected income. It may also be that myopia or misinformation consistently prevent optimal decisions.

It might be expected that persons with a certain set of Z characteristics (including socio-economic family status) tend to only look at the upper income end of the income distribution curves of occupations, while others with different Z characteristics have a tendency to look at the lower end of the income distribution curves so as to develop a strategy to achieve an income over some floor level.

As Michelson writes:

> Maximizing expected income is unlikely to be a good statistical proxy function in a risky world where people maximize the expected utility of income. An alternative function was given: maximize the probability of achieving above a specified income. If the characteristics S_i produce the highest probability of getting

> above some income level, then an oppressed group might attempt to achieve S_i regardless of the probability of success.

In a section below this decision model will be modified to consider the case of post-secondary technical education choices.

E. Other Research Results

Miller and Twyman, in a study of engineering and technical institute drop-outs at Oklahoma State University, found significant differences between engineering freshmen and first-year technical institute students.[15] Engineering freshmen came from significantly higher social class backgrounds and had higher scholastic aptitudes. They also were found to be more theoretically oriented and tended to have higher motivations to achieve than the technical institute students. The technical students, on the other hand, had a higher nurturance need which is identified as the need to help and to be helped by friends and to be treated with kindness and sympathy by others.

Among the drop-out students there was no significant difference between the two groups. The combined drop-out group had a higher need for both nurturance and affiliation than the non-drop-outs. The non-drop-outs were described as those detached from an excessive need for others. These non-drop-outs relied on their own interpretations of situations, required a certain amount of privacy and were independent of the feelings of others. The drop-out, according to Miller and Twyman, appeared "as one with a syndrome of nurturance-type needs." This person was described as people-oriented rather than things-oriented. They conclude:

> ...those with excessive affiliation-nurturance oriented self-needs are much less likely to succeed in a technical institute or engineering program than those without these kinds of needs.

Bowlby and Schriver in their Tennessee study examined the proposition that receipt of vocational training lowers the likelihood of unemployment.[16] They found that the vocationally trained male workers in their study had a higher non-work rate than the untrained male. They found that it was women and rural dwellers who seemed to achieve greater benefits from vocational training than did men and urban dwellers. They concluded that: "Vocational training is likely to confer greater benefits on an individual the more disadvantageous is his market position."

Corazzini, in his study of when vocational training should begin, reached a general conclusion that: "The graduate of post-high school vocational training has made a relatively poor investment if he chooses to train in the same skilled trades open to vocational high school students.[17]" He drew this conclusion after examining starting wage differences for vocational high school graduates and post-secondary school graduates in Worcester, Massachusetts. In comparing the average starting wage for post-secondary graduates in eleven skill areas, he found it to be $1.84 an hour, while for the vocational school graduates it was $1.76. He wrote that: "Hence overall the average premium paid post-high school graduates was a mere 8¢ an hour...or $160 annually."

For post-secondary graduates who took training in areas open only to high school graduates and which lead to technician-type jobs, the average starting wage difference was 19 cents per hour, or about $400 annually. This is a small starting wage difference after two additional years of training irrespective of future earning profiles.

In an interview with a retired General Electric personnel executive in Milwaukee who had conducted a review of technical education as part of his work in industrial relations, some other conclusions were offered.[18] One is that the earnings level of the technical institute graduate levels off quite early in his lifetime earnings cycle. The exceptions were those who eventually completed four-year engineering degree programs or those who were transferred into sales, service, or supervision. He reported that there tended to be corporate resistance to paying technicians much more than the salary for which they could hire an engineer. This seems to suggest the presence of a ceiling on longevity pay for experienced technicians.

He also recalled that the mathematical aptitude was the prevalent predictor for success in most technical institute programs and was the biggest factor inhibiting the recruitment of minorities as technicians. (In another, independent study in Milwaukee, it was determined that there were 86 minority students currently enrolled at the Milwaukee School of Engineering and that 43 of these were in engineering. At the University of Wisconsin-Milwaukee there were a total of 1097 minority students, but only 28 were in engineering.) It also seems to be true that some technicians are required to manipulate equipment or machinery which may involve mechanical skills which the average engineer and others have not acquired. It was also felt that the average two-year technical institute student was mostly either from a rural family or from a family which could not offer to send him through a four-year college program. The financial barrier also seems to determine in Milwaukee if the technical institute recruit enters the expensive ($600 per quarter) and private Milwaukee School of Engineering or the tuition free Public Milwaukee Area Technical Callege.

Heinemann and Sussna, in the conclusion of their article cited above, also claim important non-income benefits of post-secondary education. They write:

> Consider the benefits that might accompany successful completion of the two-year program. A more favorable position in the labor market can lead to broader participation in the political process, fuller personal development and achievement, and neighborhood effects-pervasive economic improvement in some part of the community which previously lacked these managerial and technical skills, stronger social cohesion, higher probability of economic success by future generations of children of currently educated persons, and others.

They admit that these benefits are difficult to measure, but it is also unclear if these benefits actually influence the amount of recruitment into the post-secondary education programs on the part of individuals from different types of recruitment pools.

Holland has reviewed a number of current psychological theories of occupational choice.[19] One of his conclusions is: "Although we cannot agree about the details, a person's vocational choice is clearly determined by a massive array of inherited aptitudes, predispositions and personal experience." He stresses that research has shown that different types of people with respect to personal development are predisposed to choose different types of occupations. Likewise, different occupations do require different types of people, at least so it seems from the research. Although Holland stresses rising aspirations with respect to occupation choices, it may also be that aspirations of would-be engineers, managers, etc., need to be lowered to a preference for a two-year technical curriculum. He also concludes that "choice is much more a function of personal interests than any specific environmental forces or events." (Models of choice involving aspirations are illustrated in Addendum I.)

F. A Simple Model

According to the terminology introduced above by Michelson, the effort to induce high school students and graduates to enroll in two-year post-secondary technician curriculums requires that they select education strategy S_{tc} where "tc" represents technical curriculum.

It can also be assumed that the recruits who choose this strategy and then succeed at it can be described as possessing a number of Z characteristics. These Z characteristics define a pool of talent (and other personal characteristics) which is finite. Consequently, students recruited into one field may deprive another on the lines of the "Peter-Paul Principle."

One Z characteristic can be defined as Z_{ma} in reference to a necessary mathematical aptitude. We can further specify that Z_{ma} be greater than some minimum level Z^1_{ma} but no more than some Z^*_{ma} level which would qualify the recruit or student for pursuing a four-year math or engineering curriculum. Thus, a condition for recruitment might be

$$Z^1_{ma} \leq Z_{ma} \leq Z^*_{ma}$$

A second Z characteristic can be defined as Z_{me} in regard to the mechanical ability required for technicians. It can be suggested that Z_{me} must be more than some level but has no upper boundaries with regard to alternative choices. (It seems to be a mute question as to whether either aptitude or ability is learned or inherited if policy is to be directed at students already in their teens.)

Another Z characteristic can be defined as Z_{ses} where it is assumed that the socio-economic status of the student family is a recruitment characteristic to the effect that in American society students attempt to make occupational choices which will leave them no worse off and perhaps better off in socio-economic status than their parent head of household.

Thus, in this case the implied socio-economic characteristic of the chosen education strategy must be such that:

$$S_{ses} \geq Z_{ses}$$

A similar S characteristic might be S_{peb} where parental educational background is a characteristic which the student seeks to equal or exceed. This suggests that another definition of the recruitment pool is:

$$S_{peb} \geq Z_{peb}$$

In both these cases the S strategy is to exceed their parents' Z characteristics.

From this we might assume a corollary that if male students attempt to equal or exceed their fathers' education background, and if female students seek to exceed their mothers' education background, most sons and daughters of college-educated parents are automatically not to be found within the "natural" recruitment pool. This assumption makes sense if we also regard occupational choices and educational backgrounds as leading to life style differences and that most American children seek to replicate or extend their parents' life style. (On the other hand, if it is true that some American students are disapproving of their parental life styles, especially among the college-educated middle class, the two-year technical education choice might be a benign way for American 18-year olds to signal their rejection of, say, their father's white collar, office, medium level intellectual occupation.)

These latter two Z characteristics should be perceived as recruitment conditions which may or may not operate as recruitment norms. Perhaps their importance as norms vary according to the socio-economic and education environments of particular regions. Where socio-economic status is more homogeneous, perhaps the "equalizing condition" prevails, whereas in heterogeneous socio-economic environments the "exceeding condition" operates. Or the very nature of the heterogeneity may itself determine the extent to which students seek to exceed their parents' socio-economic and educational status.

As an example, in an environment such as Milwaukee with a large skilled blue-collar population and a relatively slim business and professional middle class working population, the student population tends to seek to become equal (as blue-collar workers) to, or to exceed in a limited way (as two-year post-secondary graduates), their family SES and PEB.

But in another environment such as Chicago, New York City or Albany, with a large college-educated civil servant, professional and business population, the recruitment pool would be substantially different. Not only would the students from college-educated homes seek to equal of exceed their family SES and PEB, but students from non-college-educated families would seek to exceed their SES and PEB in a more ambitious way. In that case:

$$S_{ses} \gg Z_{ses} \quad \text{and} \quad S_{peb} \gg Z_{peb}$$

The adaption of this kind of recruitment characteristic into such a norm would, of course, severely limit the recruitment pool in particular regions. It is likely in such regions that new skilled and technician workers are immigrants from the Milwaukee-type region, where the recruitment pool and the technical education out-migration are both large.

Another Z characteristic which should be cited is Z_{fc} where "fc" stands for the financial capacity of the family to finance either 2 or 4 years of technician and engineering education. It may be that it is Z_{fc} which determines whether potential recruits with the appropriate Z_{ma} and Z_{me} are recruited into technician curriculums or engineering colleges.

The notion and development of these Z characteristics suggest the outline of a model which assumes that at any given time a finite pool of potential recruits exists. The pool is defined by a number of Z characteristics which cannot be easily altered. It is also true, however, that some of these Z characteristics are presented as socio-psychological perceptions that may have the strength of self-recruitment norms that operate to define the area of choice with respect to educational strategies and occupation groups. It is the members of this finite pool, then, that respond to other perceptions, such as rate of return, income distribution, risk and other "economic man" condiserations. (Following Michelson, estimated earnings are a function of both S_i and Z_n.)

This model also suggests that certain socio-psychological dimensions of personal development towards membership in the learning systems and work force may be reinforced by the nature and make-up of the urban region. This condition leads to the conclusion that manpower policy directed to improving "information" about educational and occupational choices needs to deal with "emotional man." This is especially true for those occupations for which the economic market can only be partially manipulated or subsidized. (The model also suggests the need for manpower policy to consider a way to either limit aspirations or to provide for psychic acceptance of downward mobility for those whose SES and PEB leads them to misjudge their aptitudes and to postpone their downward filtering until four or five years of college have been "consumed." This raises a difficult question for American society: In a competitive society how do you prepare identifiable "losers" to accept being losers?) Available evidence suggests that entrants into college engineering and science fields "filter" laterally in an educational sense into liberal arts and business curriculums, rather than filtering downwards into two-year technical curriculums.

G. Alternative Scenarios

As suggested by the distinction between a Milwaukee or Pittsburgh-type of environment and a New York or Albany-type of environment, alternative scenarios could be generated to suggest other ethnographic differences contributing to the selection of different educational strategies in different types of urban regions or rural areas.

These scenarios could then be tested against reality. Or ethnographic accounts could be obtained by actual research in a small number of distinct urban regions.

Another kind of descriptive analysis could be developed by using Markov chains. The previous choice of education strategies by students entering the learning/labor force between 1950-70 from households with different characteristics corresponding to the Z characteristics suggested above could be used to determine the probabilities of recruitment into post-secondary technical education in the decade ahead. If there has been a rise in SES and PEB generally in the 1950's and 1960's, it might be expected that those choosing to enter two-year technical curriculums will decline proportionately in the decade ahead.

Other scenarios might be suggested that would feature intervention in this relative decline through promotion of the lifestyle of the tech-ed graduate with appropriate multi-media presentations.

H. Research Needs

A number of research needs are quickly suggested by the analysis developed above. First, what exactly are the rate of return opportunities for technical education graduates? What realistic alterations of projections from past earnings and participation rates can be made? Are opportunities for sequential advancement and movement into a higher earnings curve an important aspect of decision-making for recruits into two-year programs?

Second, what are the determinants of industrial preferences with respect to their recruitment of technical institute graduates? What alterations in the characteristics of the technical institute graduate are they likely to support, encourage or tolerate? And what will be the role of union representation as this occupational group is increasingly unionized?

Third, both the occupational and employment or job characteristics for the technical worker must be better analyzed, understood and interpreted. Lewis Carliner in Dissent (Winter 1972) suggests that the "white collar on the ex-blue-collar is a cool collar" in reviewing the experiences of some computer operators. But he also reports a perception of some traditional alienation. Again, it might also be suggested that work style differences vary from one urban region to another. Mobility into technician-type jobs may be perceived favorably in one region and not in another due to real differences in work practices and traditions in different regions. (For example, in one type of region technicians might be let off at 4:30 in the afternoon to take 5 o'clock engineering classes at the downtown institute, while elsewhere the same technician may only make the 6 o'clock class and not make it home until after 9:00. Or, how are the technicians "placed" with respect to skilled operators and company engineers with respect to workplace social patterns?)

Fourth, other economic correlates of wage and salary conditions for technicians should be established. What is a typical family budget for technicians in different urban areas? Can he "keep up" with the lifestyle requirements of college graduate peers from his cohort group? Or does he "keep down" to the level of his high school graduate peers? An $11,000 income recipient looking up to a $14,000 income is a different economic problem than looking down at $9,000 incomes.

Fifth, it has been suggested in the analysis above that the technicians may be recruited upwards from the same pool providing skilled blue-collar workers and downwards from the pool providing engineering students. If it is expected by manpower or educational planners that technical institute students can be recruited from general studies high school graduates or from the pool of liberal arts college entrants, it must be determined whether these students can alter, or have altered, both their aptitudes and aspirations. (And whether such an effort should occur in the schools or be left to the market place.) It must also be determined if either the general studies or college preparatory curriculums in high school are preparatory to the post-secondary technical institute curriculum. It is also important to determine whether the high school vocational studies curriculum geared to blue-collar skills skims on mathematical preparation in such a way as to limit the recruitability from that pool into technician studies.

Sixth, related to the above must be the determination of the extent to which the mathematical/mechanical aptitude requirements can be attained through earlier or remedial math and mechanical training.

Seventh, the locational requirements of potential recruits into the technical institute curriculum must be determined, so that the appropriate number of technical institutes can be appropriately located within student commuting distance from wherever the talent pools are concentrated. This suggestion is predicated on the belief that technical courses added to every community college dilute the quality of technical education and training. Equipment requirements and proximity to industrial field placements are infrastructure requirements of technical education that cannot be ignored.

Eighth, the regional mobility desires of members of the potential recruitment pool must be considered. Do the potential recruits desire that their post-secondary education give them the option to move away from their hometown? Or do they reject technical studies because the technician jobs are situated in such a way that they would be compelled to move?

Ninth, the problem of "damping" or adjusting the aspirations of would-be college graduates with their dreams of "management" positions must be more carefully researched. There are mental health problems associated with this that neither schools or social service agencies are adequately treating.

Tenth, the attractiveness of technician jobs and technical studies to women must be considered. If social need-oriented men are deflected from entering technical studies because the environment is non-supportive, and if more women students reject the vision of being college-educated secretaries, perhaps an untapped pool of potential women recruits exists to meet the technician "shortage." (It may also be that married technician women with children can be employed on a partial shift basis. A firm outside of Milwaukee has instituted a "mothers' shift" between 9 am and 3 pm.)

I. Some Policy Conclusions

From this review of some of the literature concerning technical education, some policy conclusions come to mind. First, obviously additional research is required. At the very least ethnographic studies should be conducted for the RCA Institute in New York, for selected technical programs through New York State and in a paradigmatic environment such as Milwaukee which is said to have one of the lowest central city high school drop-out rates because of its superior post-secondary vocational and technical education system.

Second, better "pre-technology" programs could be developed in the junior high schools and early years of high school. This pre-technology program must include general, vocational and college-bound students around a common core of math and mechanical studies. If more typical non-aptitude students are equipped with a functional math/mechanical literacy at an earlier age, perhaps the technical institute curriculum will not be so inhibiting to students outside the existing recruitment pooled as defined above. Among other things, this pre-technology program could get women into welding, history students into health technology, and mechanics into math games.

Third, there needs to be developed a "technology preparation sequence" that is available both in and out of high school. This should provide additional preparation after high school to general studies students and refresher training to veterans and other adults who have been out of school.

It should also be an option open to college drop-outs and should also be available to blue-collar workers on a special outreach basis. These latter two suggestions are to insure that the recruitment pool is not arbitrarily reduced in size at a premature point.

Fourth, the two-year technical institute curriculum should also fulfill (at least partially) the first portion of the requirements for a B.S. in engineering. This will help to attract the potential engineering school drop-out before he drops out. It will help to merge the technician and engineer recruitment pools or to avoid their artificial separation. The concentric curriculum pioneered by the Milwaukee School of Engineering is a possible model. The MSOE model also suggests that the prestige of the two-year curriculum can be pulled upwards by its attachment to a four/five-year engineering college. Both technician and engineer are "alums" of the same school.

Fifth, in line with that kind of attachment might be the need in New York State to attach the technical institutes to colleges of engineering or else provide that the freshman year for college engineers be conducted at the community colleges along with the technology sequence.

Sixth, a special video tape series for public education television should be developed on the theme of "work and life in the American city." Such a series should stress the work of technicians and other two-year graduates.

Addendum I

Models Incorporating A Level of Aspiration

The level of aspiration is defined as that occupational goal which a person undertakes to reach. Usually it is lower than some maximum desired goal because the person has accepted the real world conditions of his immediate environment. But it is also normally higher than some minimum goal.

Lewin has taken a level of difficulty, x, as a basic reference variable for discriminating between goal alternatives. If $P(x)$ is the probability of success, $S(x)$ the utility of success and $F(x)$ the disutility of failure, then the level of Aspiration A is defined by Lewin as the level of difficulty which maximizes the expected utility, $U(x)$ where:

$$U(x) = P(x)S(x) - [1-P(x)]\,F(x)$$

He defines the level of aspiration as that value of x which satisfies two conditions.

$$1- \frac{dU(x)}{d(x)} = 0 \qquad x = A$$

$$2- \frac{d^2U(x)}{d(x)^2} < 0 \qquad x = A$$

Simon and Starbuck have defined another model based upon Simon's theory that the person has only a limited view and therefore, makes only simple choices between two goal alternatives, satisfactory and unsatisfactory. The level of aspiration plays a central role in this model as it establishes the two alternatives.

Starbuck has developed several postulates for this model. The first postulate is that the utility curve represents a step-type function. All alternatives are partitioned into satisfactory and unsatisfactory subsets. The level of aspiration is the point at which partition occurs, or:

$$U(x) < 0 \quad \text{for} \quad x < A$$

$$U(x) > 0 \quad \text{for} \quad x \geq A$$

Since utility can't be directly measured, the second postulate is that all satisfactory alternatives are equivalent in utility. The person's activity is interpreted as being primarily a search for some satisfactory alternative--as soon as he finds one he stops searching.

This second postulate may be written,

$$U(x_i) - U(x_i) \leq Ds$$

when $U(x_i) \geq A$ and when Ds is the disutility of searching for another satisfactory alternative.

The third postulate is that the individual will set his level of aspiration so as to hold constant his expected utility from finding a satisfactory alternative. If a function ϕ (x) expresses the probability of finding an alternative corresponding to the level of achievement (x), then

$$K_o \leq \int_A^{\infty} \phi(x) \cdot U(x)dx \leq K_o + K_1$$

where K_o and K_1 are constants defining the range within which the integral is constant and of desirable magnitude. In the model, U(x) is approximately constant and ϕ (x) varies with his perception of his environment. Defining U(x) as unity for x=A, the postulate becomes

$$K_o \leq \int_A^{\infty} \phi(x) \cdot d\,x \leq K_o + K_1$$

The individual will, therefore, set his level of aspiration so as to hold constant his perceived probability of finding a satisfactory alternative.

If it is easy to discover satisfactory alternatives, the individual will raise his level of aspiration; conversely, if satisfactory alternatives are difficult to find, then the level of aspiration will be lowered.

Duffy holds that the dichotomy of satisfactory-unsatisfactory is an oversimplification.

Duffy assumes that each person has a spectrum of occupations in mind. A person about to leave school or choose additional schooling will assign subjective or expected utilities $U(x_1)$, etc., to each of the occupations, x_1, x_2, etc. These utilities are obviously a function of concerns with income, costs, status, etc. To each of these occupations he also assigns a subjective probability $P(x_1)$, etc., which is his estimate of getting a job in that occupation and succeeding at it.

These probabilities are probably stable in the long-run and may not change until after a job search and/or experience has been unsuccessful. Taking a hypothetical example, a young male with what is popularly known as a "mechanical turn of mind" may assign his subjective utilities and probabilities in the following way:

	U(x)	P(x)
Airline pilot	50	0
Engineer	40	0
Electrician	20	0.1
Mechanic	18	0.1
Auto mechanic	16	0.2
Plumber	16	0.1
Molder	12	0.2

The first postulate is that search behavior will be initiated for all occupations in the person's spectrum which fulfill the conditions

$U(x) > 0$

$P(x) > 0$ or some minimum level.

Duffy says that job x_j will be chosen or accepted if

$$P(x_i)U(xi) - U(x_j) < D_{si}$$

$$\text{and } U(x_1) > U(x_j)$$

where D_{si} is the disutility of continuing a search for x_i after x_j is available for attainment.

If we regard enrolling in a four-year liberal arts college as the continuing search for x_i after x_j (or enrollment in a technical education curriculum) is rejected, there is obviously little disutility involved especially for children of affluence. In that case it would be necessary for information (if not propaganda) to be used to bring the subjective probability $P(x_i)$ down to a starkly realistic level. Alternatively the information effort might focus on changing the perceived utility by focusing on being a partial failure at job x_i.

The other effort could focus on raising the perception of the utility offered by x_j. This model however, suggests that any information effort should possess three if not four attributes. These attributes include: (1) the disutility of "wasting" time in a general college curriculum, (2) the difficulties involved in becoming successful at job x_1, and (3) the satisfactions associated with job x_j.

Source for Addendum I: Duffy, Norman F., "A Model of Choice in an Australian Labor Market," Journal of Human Resources, Volume 4, pgs. 328-342.

Addendum II

Hansen's Analytical Questions

Given shifts in demand curve for scientists and engineers, what kinds of market responses, e.g., changes in earnings and changes in numbers of engineers, are likely to occur in the immediate period, in the short-run, and over some longer period?

What are alternative methods of increasing the supply of engineers, and what are the costs and benefits of these alternative methods? How rational and effective have federal policies been in enhancing supply?

What accounts for adjustment lags in the various markets, how great are these lags, how might they be reduced, and what would be the costs of reducing them? What kinds of interrelationships and interactions exist among the product, factor, and research market? Which of these can be influenced and by what types of policy? What will be the extent of these influences? What is the impact of technological change on the market for engineers; what adjustments flow from this impact? Is it useful to think of different kinds of technological change?

What has been the impact of changing federal budget allocations on the engineer labor market? If there have been insufficient numbers of engineers to meet growing private plus rapidly expanding government demands, to what degree has our "progress" been slowed? What would have been required to prevent such "slowing?"

Source for Addendum II: Hansen, W. Lee. "The Economics of Scientific and Engineering Manpower." Journal of Human Resources, Vol. II, No. 2, pp. 191-220.

FOOTNOTES

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2. See Rhine, S. H. and Creamer, P. The Technical Manpower Shortage: How Acute? N.I.C.B., N.Y., 1969, and B.L.S., Dept. of Labor, Technician Manpower 1966-80, Washington, D.C., March 1970.

3. This assumption might be questioned, but it is an assumption which meets the self-interest of employers who wish to avoid job-training costs and educators who wish to direct training through conventional educational processes.

4. Adam Smith. An Inquiry Into the Nature and Causes of the Wealth of Nations. Random House, New York, p. 99.

5. For a review of this perspective see S. Rottenberg, "On Choice in Labor Markets," Industrial Labor Relations Review, Vol. 9, pp. 183-99.

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9. See Becker, G. S. Human Capital: A Theoretical and Empirical Analysis with Special Reference to Education. National Bureau of Economic Research, N.Y., 1964, and Hansen, W. L., "Total Private Rates of Return to Investment in Schooling," Journal of Political Economy, LXXI, pp. 128-40.

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16. Bowlby, R. L. and Schriver, W. R. "Non-Wage Benefits of Vocational Training: Employability and Mobility," *Industrial and Labor Relations Review*, Vol. 23, pp. 500-509.

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18. Interview with Ted Cardiff, Center for Community Leadership Development, October 10, 1972.

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APPENDIX D

RECRUITING TECHNIQUES

A. Overview

Educational researchers apparently have not regarded student recruitment as much of a problem. The amount written on the subject is barely enough to qualify for a distinct heading in research indexes.

Yet, "recruitment" *is* a heading in the indexes and research *does* exist. More particularly, researchers in recent years are recognizing the the need for better recruitment of students into technical programs. Most of the recruitment research for such programs has occurred in the last four years. The concern has focused primarily on technician programs at the Associate of Arts level. The combination of scholarship money, prestigious occupational training and higher degrees has ameliorated the recruitment problem for technical education at the baccalaureate, master's and doctoral levels.

The attention to the two-year technical programs is understandable. It has been a national concern that educational programs produce enough technicians for the nation's manpower needs. Forecasts of large technician shortages in the 1970's have heightened this concern.

It is therefore timely that recruiting for technical programs in community colleges constitutes the major focus of this paper.

Two problems confront a review of the research done on such recruiting, however. First, not all the research done on recruiting students is necessarily applicable to the recruitment problem for two-year technical programs. Some of the research concerns itself solely with recruiting disadvantaged students into non-public, non-post-secondary manpower programs. The characteristics and aspirations of such students do not match those of community college students, nor are the programs similar to those for training technicians. This paper does not consider such research because of the disparity in the two situations.

Other research appears on recruiting students into teacher training programs. Such training involves students at a baccalaureate or post-baccalureate level. In addition, the training may act merely as a supplement to previous education which can qualify students at similar if not higher job levels. On the other hand, technician programs are intended to give students training which can enable them to get jobs at a qualitatively different level than they might get without the training. Again, the two situations appear to involve different clients with different sets of aspirations. For this reason, the research on teacher training programs is bypassed. In short, then, this paper elects to consider only research on recruiting for community colleges or for technician-training programs.

Second, the advent of television as a potentially major medium for recruiting within the past 20 years make any research done before the 1950's questionable in its value. Recruiters may choose to ignore television but they cannot slight its impact on the relative merit of different recruiting techniques. As a consequence, this paper does not review research done before the early 1950's.

(These exemptions do not apply to research done on the general effects of communications and persuasion. When it is relevant, the paper includes this research).

There are three major research pieces which specifically concern recruitment for technical programs at the community college level. All have been done within the last four years. Two are dissertations, the first involving a survey of recruiting techniques used by community colleges for technical programs and the second describing a controlled field experiment to persuade more students to enroll in a mechanical technology program. The third is a three-year project to develop, implement and evaluate a recruitment package for community college industrial technology programs.

In 1968 Krejcie surveyed a national sampling of 79 community colleges on their recruiting for industrial-technical and engineering technician programs. The data came from the person at each school who had the major recruiting responsibility in addition to a random sample of 757 first-year students enrolled in the programs during the 1967-8 academic year.

Krejcie reports on the recruiting practices and contacts used by the schools to encourage students to enroll. This data, along with complementary data on the impact of each practice or contact on student respondents, is contained in Table 1.[1] The author also explores the impact of specific media which the schools used for recruiting. This data appears in Table 2.[2] In general, Krejcie found that community colleges were misplacing their recruitment efforts, overusing practices and media with little impact while ignoring those media and practices with much more impact.

The survey showed that exhibits, open houses, career days and conferences at the colleges; career days and conferences at the high schools; and interviews of interested students had much less impact on students than should be apparent from the colleges' use of each practice.

On the other hand, lesser efforts in creating contacts with high school teachers and in sponsoring industrial arts contests for high school students had a proportionately greater impact on students. Tours of the college shop facilities also had a greater impact than one would expect from the colleges' efforts.

Asking student and college respondents which practice they felt had the greatest effect on enrollment, Krejcie found that students ranked contacts with high school teachers first. Following were contacts with college counselors or student personnel directors, contacts with high school counselors, interpretations of the technical programs to faculty and staff at the colleges and contacts with employers about courses offered through the programs.

The responses of the college personnel indicate that they are poorly gauging the effects of their recruitment practices. Of college personnel, 25% saw contacts with high school counselors as having the greatest effect while only 9.1% of the students agreed.

The college personnel also overestimated the impact of college and career days at the high school (9.5% to the students' 3.0%) and grossly mistook the effects of interviews with students (31.2% to 1.3%). They underestimated their contacts with high school teachers (4.7% to 12.2%) and the contacts with local employers (1.6% to 5.9%).[3]

The community colleges did not fare any better with the media used in recruiting. Heavily-used media did not produce the impact they should have produced, and the college respondents' perceptions of those media did not match the students' perceptions. Specifically, most of the colleges used motion or still pictures of shop facilities and personal letters to students at least occasionally. Neither had much influence on students. Similar results appeared for program promotion through direct mail and for college newspaper advertising. Meeting with more success were college catalogs; motion or still pictures on the career opportunities available to program graduates; and booklets, leaflets and flyers on job opportunities.

Asking which medium had the greatest effect on student decisions to enroll, the survey showed college catalogs meeting with the most student approval. Booklets on job opportunities, articles in newspapers describing the programs and subsequent job opportunities, and motion or still pictures on job opportunities took the next three places.

The college personnel underestimated the impact of all but one of these media. Close to a majority, 44.4% thought that the booklets had the greatest effect. Only 29.4% of the students agreed. The personnel also made poor estimates for direct mail promotion (9.5% to the students' 3.9), personal letters to individuals (15.9 to 1.6%), and motion or still pictures on the program facilities (3.2% to 1.1%).[4]

In addition, Krejcie determined that the individuals who influenced students to enroll were:[5]

1.	parents or guardians	20.6%
2.	student's own decision	19.7%
3.	guidance counselor	16.8%
4.	teacher	13.1%
5.	friend or acquaintance	10.6%
6.	relative	6.5%
7.	wife or girl friend	5.2%
8.	employer	4.9%
9.	other	2.6%

The second major study that directly pertains to recruiting students for technical programs is a controlled field experiment in persuasion. In 1969 Richards developed the experiment for a dissertation. Its purpose was to test the effects of differently presented recruiting letters on the number of students applying to the mechanical technology program at Mohawk Valley Community College, Utica, New York.

The results showed that applications came more quickly with the direct mail tactic. This appeared to cause a more lasting effect as well by sustaining the level of applications over a longer period of time. In addition, the recruiting had a limited overlap effect on increasing enrollments for other engineering programs at the college. Finally, Richards determined on a simple cost-benefit basis that the mailings had been financially worthwhile by bringing in enough new applications.[6]

Richards specifically recommended to MVCC that it concentrate its efforts on students intending to go to a two-year college, that it recruit within a limited geographic area and that it recruit for the engineering curricula together rather than singly.[7]

The third major study involves the recent efforts of Compton College, a two-year community college in Compton, California, to devise, implement and evaluate a communication and recruitment process in a three-phase, three-year project just now being completed. It is atypical in that it focuses its concern for recruitment not on high school students, but on those who have left the educational system. This includes dropouts and other groups as well, such as older people who may need job training. It has also trained individuals to act as recruiters, not to mention that the individuals were students in this particular case.

The project's "Recruiter Training Manual" describes the program's history more fully:

> The Communication and Recruitment Project, Phase I (of 3 Phases) was developed in 1970 by Compton College, together with industrial concerns, students, and the community. The idea was to develop a program for occupational counseling and recruitment of students on a one-to-one basis, directed primarily to minority and disadvantaged groups. Exemplary in nature, it was designed to be used by any agency in any state. A recruiting booklet and audio-visual aids were developed to be used by recruiting teams in Phase II . . .
>
> Phase II got underway in 1971. During Phase II, a full staff of student recruiters was hired, trained, and sent into the community. Instructional and audio-visual materials were further developed . . . Over 1,000 homes in the community were contacted . . .[8]

The project includes a mobile recruiting van as well.

Preliminary evaluation indicates that of 1200 contacts made during the summer of 1971, between 180 and 200 enrolled for the following fall semester, and of 2,021 contacts from October to January about 248 enrolled for the spring semester. "These included persons interested in enrolling for the first time, returning students, and students currently enrolled who were seeking counseling pertaining to their respective major fields of study," said a June, 1972, memo on the project.[9]

Going beyond the above three pieces of work, a study by the Erie Technical Institute, a two-year school in Buffalo, New York, showed results similar to those of Krejcie. While it was primarily a survey to convey student attitudes to faculty members, the study included questions on recruitment practices. It indicated that the most influence in recruiting came from high school counselors, followed by college counselors, parents and other adults, friends, and brochures, leaflets, or other printed material coming from counselors.

Factors showing little influence were college and career days in high schools and the mass media, including mailings, newspapers, public displays, posters, billboards and the like. The report concludes that career days need improvement as a recruiting device.[10]

The literature reports other recruiting efforts, largely in the form of case studies containing little evaluation. Miami-Dade Junior College in Florida, for instance, advertises specific programs in trade journals to get employees to refer people to their programs. It has also provided industry salesman "who call upon departmental heads and instructors, with literature concerning the College's programs connected with the salesman's industry or professional field. These salesmen are urged to distribute the literature to employers and other industry personnel."[11]

Krejcie reports recruiting techniques mentioned by college respondents in his survey but not evaluated in the survey results. Included are alumni meetings; group counseling during orientation week; equipment demonstrations; talks by industrial representatives at high school and college career days; and the offering of vocational program evaluations for review by prospective students and the general public.[12]

B. Media

Which media are most appropriate for recruiting? Radio? Or television?

Lectures? Or personal interviews?

There is little research that sheds light on this problem. Krejcie's work presents an impressive evaluation of different media and recruiting practices according to their relative impacts on student decisions to enroll, but there is no way of separating the effects of content from the effects of the medium itself. For instance, prospective students may be much more amenable to receiving information over television than through catalogs and brochures. However, the information on job opportunities in the catalogs and brochures may overcome any negative feelings about written material.

Richards finds direct mailing to be effective, but the same problem also exists here. There is almost no way to tell whether the letters themselves had any effects which cannot be explained by the information contained in them.

Communications research adds to the confusion. The available data on radio and television is ambiguous about their merits as media. The most unequivocal data exists for written material. In the recruiting context even that seems ambiguous. "The most widely reported characteristic of written media users is their relatively high educational attainment and socio-economic status," says Havelock in a major compendium on innovation through different communications strategies.[13] This would seem to suggest that catalogs and brochures be abandoned insofar as the socio-economic status of students frequenting community colleges drops.

"(R)eaders see science as beneficial and scientists as dedicated and trustworthy men, in contrast to non-readers, who view both with general mistrust," says Havelock again in reporting the work of Davis.[14] This would seem to imply that catalogs and brochures be kept as a means of most effectively reaching students who are likely to hold favorable attitudes towards a technical program.

Finally, the work of a number of media researchers indicates that readers of the mass media are likely to consume all of the mass media. A person who regularly reads a college catalog or brochure could therefore be reasonably expected to catch similar recruitment information from a television advertisement.

Research exists for other media, including lectures, discussion groups, letters, mass mailings, and two-way television. Most appears either irrelevant or not applicable to the recruiting problem. The implications of some of it for recruiters are so obvious as to be stated pointlessly here.

What may be more valuable in discussing media is the distinction which Havelock draws between one and two-way media. One-way media involve varieties such as radio, television, lectures, and brochures--in other words, media where the audience does not generally respond back through the same medium. Two-way media include discussion groups, conversations, and interviews--those media allowing interchanges.

The difference is important. Havelock points out that one-way media are appropriate for passing on information while two-way media are "imperative" if personal behavior or attitudes are to be altered.[16] For instance, if recruiters merely needed to give people specific information about technical programs, then television and radio advertisements would be more appropriate than discussion groups, as would brochures and catalogs. If the recruiter also needs to persuade or reassure a prospective student that the programs involve the best available training or are well-suited to the person's interests, then the interview or discussion group would be better.

This distinction does not specify the exact medium a recruiter should use for reaching his audience, although it does give recruiters a guideline for deciding which alternatives may be best in a particular recruiting situation.

The guideline also limits the types of media to the level where a recruiter in trying to persuade people to enroll can consider the proper sequence of media. Is the decision to enroll very likely if the prospective student first hears of a program through a two-way medium (e.g., a personal interview) followed by a one-way medium (e.g., a brochure)? Is it more likely if the interview comes before the brochure? Since both sorts of media are mixed into the recruiting process, such questions of sequencing are important.

Havelock approaches the questions from the standpoint of persuading people to accept innovations. His conclusions are nevertheless relevant. The recruiting process is analogous to that for innovating, with the recruiter acting as the innovator, and the technical program acting as the "innovation," at least for the student.

In the early phases of innovating or recruiting a particular person, one-way media are probably best. Later stages, says Havelock, should include more personal contact:

> In terms of phases of adoption, the following generalizations seem to hold: impersonal sources are most important during the "awareness" phase; during the "interest-information seeking" phase the receive may turn to an expert, to the mass media, or to personal contacts as sources of information. Personal sources, however, assume greater importance at the evaluation, or "mental trial" stage . . .[17]

This would seem to imply the following recruiting process. One, prospective students find out about a program through brochures, catalogs, lectures, or television and radio announcements. Two, as their interest increases, high school and college counselors may contact them, or the community college may set up discussion groups, career days and interviews with program teachers. Three, in the final stage they may turn to parents, friends, or teachers with whom they have some personal contact. As the Krejcie study suggests: at this point recruiting efforts may simply insure that parents and teachers are well-informed about the programs.

C. Content

Like media, the content of recruiting efforts is difficult to evaluate apart from a specific medium. This problem is endemic to most of the recruiting studies mentioned above. In addition, content is more a matter of artistry than specific guidelines for a number of recruiting situations. This particularly holds for two-way media such as interviews, discussions, and personal conversations where much depends on the participants' personalities and the nature of their interaction.

It is also true to an extent for media such as radio and television advertisements or lectures. Hovelock has done research suggesting that information given first in a lecture has a predominating influence over information given later on, but the proper application of this rule of primacy is uncertain.

Richards' field experiment at Mohawk Valley Community College constitutes the best available data on the effects of different presentations in a recruiting situation. Although Richards used direct mailing as a medium, the experiment's results seem equally applicable to all one-way media. The fact that the mailing was targeted does not seem to detract from this conclusion.

The letters contained either a one-sided or two-sided argument and had either an implied or explicitly-stated conclusion. The one-sided argument specifically tried to persuade students to enroll in mechanical technology at MVCC. The two-sided arugment mentioned other alternatives. Some of the letters stated that students should enroll in the MVCC program while others left this conclusion implicit. Consequently, Richards had four test treatments of four basic types of letters going to four test groups.

He developed three hypotheses for content and presentation for the experiment:

1. The two-sided arugment without the explicit conclusion will be most

effective while the one-sided argument with the conclusion will be least effective.

2. There will be no significant difference between the one and two-sided communications or between those communications with and without explicit conclusions.

3. Applications will significantly increase from those letters with two-sided communications and those without explicit conclusions.[18]

The conclusions Richards made were:

1. Letters without conclusions were significant in increasing the number of applications for the total population and those intending to go to two-year schools.

2. Letters without conclusions had no significant effect when they were one-sided.

3. There was no significant difference between one-sided and two-sided letters, or between those with conclusions and those without conclusions.

4. The two-sided letters had significantly more effect in increasing the applications than one-sided letters for those intending to go to two-year schools.

5. Letters without conclusions had a greater effect than those with conclusions for the total population and those initially intending to go to either two-year or four-year schools.

6. The two-sided letters had a slightly greater effect on increasing enrollments than one-sided letters or no communication at all.[19]

The cumulative conclusion is that recruiters should prepare materials that present arguments both for and against enrolling in a technical program. The materials should also allow the prospective student to come to his or her own conclusions that enrolling would be the best action.

More specific recommendations on content are hard to come by.

Compton Community College in its recruiting project has developed what may be the best set of guidelines for presentations. Noting that a program brochure should be more than a detailed index of course offerings, its first phase report says:

> Rather, it should convince the reader of the importance of education and job skills, communicate the availability of the necessary training, and encourage him to avail himself of this training.[20]

The report adds more specific guidelines on the development of a brochure:

1. It should be limited in length.

2. Its appearance should be inviting.

3. The text should have many "attractive, realistic" photos showing people to whom the prospective student can relate.

4. The text should be friendly and informal.

5. The cost of printing should be reasonable.[4]

The Compton study also comments on a number of public school catalogs that it reviewed, saying that:

> . . . most do not serve as effective communication and recruitment devices. In general, these catalogs are unattractive and contained little more than lists of courses and credits . . . Further, many of these booklets are difficult to interpret, discouraging even those who may attempt to read them.

Pursuing its own guidelines, the Compton project designed a prototype brochure, "Let Us Fit You Into This Picture." It concentrated on the occupations for which people could be eligible with the proper training. The information included job duties, wages, other benefits, requirements, and the post-secondary schools in the Compton area where the needed training was available. It featured illustrations showing Blacks and Chicanos at work. It also spent some space on interview with graduates of the college programs.

Finally, the President's Manpower Report of 1971 mentions counselors who have put together brochures on employers served by their schools to give potential students an idea of job opportunities in the area. The counselors listed the types of entry jobs in each firm, hiring requirements, opportunities for advancement and working conditions.[23]

D. Implementation

The responsibility for implementing a recruitment program has been at best a nebulous thing. There are few recruitment personnel specifically designated as such. Furthermore, 67% of those responsible for recruitment spend less than 20% of their time on it, according to Krejcie.[24] The director, chairman, dean, or supervisor of vocational-technical education took the recruiting responsibility at 54.7% of the colleges surveyed by Krejcie. Directors of admissions or registration lagged behind with 18.7% of the lead, while counselors took 8.0%, coordinators of vocational education had 5.3%, deans of student affairs dropped to 4.3%, and sundry other officials split the rest.[25]

Beyond this, there has been little consideration of what responsibilities individuals beyond the college might hold as far as recruiting. Particularly appropriate might be high school counselors. Other individuals may best take the responsibility for recruiting groups not going to high school.

Industries that hire the graduates of occupational programs receive the most direct attention. Burt recommends the creation of advisory councils for industry-school cooperation and also for help in recruiting. He adds the caveat that participating industries must be willing to aid the programs with a continual effort.[26] Grece sketches the experiences of one such council working in Connecticut in 1964. Council members had their primary recruiting effort in the form of a large dinner that included high school representatives, government and industry officials, and the press. The intention was to put the idea of chemical technical education before the public, students, and parents. Recruiting rose the next year by 59%, but in 1966 it dropped to 13% above the 1964 level, indicating that an ongoing recruiting effort is needed.[27]

The Compton College Communication and Recruitment Project has developed what is undoubtedly the most unique approach to implementing a recruiting program. Handled through the college's Division of Occupational Education, the project relied on a team of 50 students to do recruiting. Ten of these students acted as team leaders. The rationale for such an approach lay in the need to reach disadvantaged people in some way other than typical recruiting methods:

> The information gained during Phase I indicated that disadvantaged students can be recruited more effectively through an individualized approach. The approach recommended would require in-service training of selected recruiters. For proper rapport between recruiters and students, the recruiting team should include representatives of various ethnic groups, the percentage of each to be determined by the population of the community in which recruitment is performed. For the most part, recruiters should be students of local schools. However, the team should also include adults from the community and perhaps senior citizens.
>
> Following special training, the recruiters would be given the names of individuals who should be encouraged to obtain additional education--those who have dropped out of school and those still in school who do not plan to continue their education. The recruiters would make personal visits to the homes of these individuals, explain the advantages of further education and training, and provide educational counseling. Each recruiter would make use of a specially prepared recruiting brochure and visual aids. The brochure would be left with the prospective student upon conclusion of the interview.[28]

The project paid each recruiter, both for the training period and the actual recruiting.

The training period itself included a lesson per week over a five week span. The lessons involved the program's operation, the educational and financial resources available to potential students in the Compton community, information on registration and counseling services at the college, interview techniques, and role playing to gain interviewing experience.[29]

E. Recruitment Timing

The problem of timing is most precisely defined for the recruiting of high school students. With the people already in an educational institution and definitely ranked by grades, timing is largely a matter of figuring out what tactics to use at what time.

The Krejcie study found that of the first-year students enrolled in the surveyed colleges, 18.1% decided to enroll after leaving high school while 53.2% decided in their last two years of high school, 10.7% in the 10th grade, 5.8% in the 9th grade, and the rest before the 9th.[30] The obvious implication is that, insofar as high school recruiting is concerned, the major efforts should be in the last three years and predominantly in the last two.

In the Erie study, students decided for the most part on their career plans in the 12th grade with some affected as early as the 11th. This broke down differently for those in the engineering curricula. Those in the mechanical technology program made their decisions to enroll from the 10th through the 12th grades. Electrical technology students also indicated interest in the program as early as the 10th grade.[31]

On the basis of his experiment, Richards recommends to Mohawk Valley Community College that recruiting take place in the junior year with a schedule that overlaps into the senior year.[32] Burt, however, speaks of a growing awarenesss by industry in 1967 of the need to start recruiting as early as junior high school. He does not substantiate this with evidence that the decisions occur that early.[33]

The test group was 1757 male high school juniors taking either chemistry or physics and indicating in a preliminary questionnaire that they intended to enroll in an engineering-related curriculum at a two or four-year college. The students were from 137 high schools in 12 upstate New York counties which constituted the recruiting area for MVCC.

Richards divided the students into a control group and four groups that were to receive different "treatments" aimed at persuading them to enroll in the MVCC mechanical technology program. The treatments varied according to presentation. Each student was to receive six similar treatments with Richards choosing direct mail promotion as a medium. The following section on the content of recruiting efforts more fully describes that part of the experiment having to do with different presentation.

In general, the direct mail approach significantly increased the number of inquiries to the college. It also increased the number of applications from the total student population and those who had originally intended to go to a two-year college, but the results were not significant for undecided students and those intending to go to a four-year school.

TABLE 1

	College Use				Student Influence			
	Extensive %	Moderate %	Occasional %	Not Used %	Major %	Minor %	Undecided %	None %
Exhibits and open houses at the college	6.4	34.6	42.3	16.7	2.9	12.8	4.6	79.6
Career days or conference activities at the college	9.0	29.5	41.0	20.5	4.0	15.3	6.9	73.8
Tours of the college shop facilities	19.2	43.6	29.5	7.7	10.8	19.0	4.9	65.3
An exploratory course designed to stimulate interest in this program was offered at the college	6.4	15.4	6.4	71.8	7.7	12.8	9.1	70.4
Visits to high schools to interview interested students	52.6	23.1	17.9	6.4	6.1	7.4	5.3	81.2
College and career days at the high school	42.9	28.6	15.6	13.0	8.5	18.0	6.9	66.7
Industrial arts contests for high school students	0.0	2.6	10.4	87.0	4.9	9.9	5.5	79.7
Contacts with college counselors or directors of student personnel	41.0	38.5	11.5	9.0	22.5	32.4	6.9	38.3
Interpretations of these programs to faculty and staff at the college	19.2	33.3	41.0	6.4	15.9	22.2	6.0	56.0
Contacts with high school counselors	53.8	37.2	9.0	0.0	18.6	27.9	5.7	47.8
Contact with high school teachers	23.1	38.5	35.9	2.6	18.2	22.2	6.6	53.0

TABLE 1 (Continued)

	College Use				Student Influence			
	Extensive %	Moderate %	Occasional %	Not Used %	Major %	Minor %	Undecided %	None %
Contacts with local state employment service personnel about course offerings and entrance requirements	7.8	28.6	40.3	23.4	4.0	6.7	7.1	82.8
Contacts with local employers about course offerings	16.9	50.6	27.3	5.2	8.5	11.1	4.8	75.7

SOURCE: Krejcie, R.V., "The Relative Effect of Selected Practices and Media Upon Student Enrollment in Industrial-Technical and Engineering Technician Programs at the Junior College Level.

TABLE 2

Media	College Use				Student Influence			
	Extensive %	Moderate %	Occasional %	Not Used %	Major %	Minor %	Undecided %	None %
Motion or still pictures of the college shop facilities	18.2	24.7	32.5	24.7	1.5	8.2	4.5	85.8
Motion or still pictures of employment opportunities and careers open to graduates of these programs	2.6	14.5	40.8	42.1	13.0	25.8	8.0	53.3
Picture story of these programs told through mounted photographs displayed in public build ings in the community	3.9	19.5	33.8	42.9	1.9	7.6	6.6	83.9
Posters and placards	3.9	22.4	28.9	44.7	0.4	7.3	7.0	85.3
Billboard advertising	0.0	1.3	5.3	93.4	0.4	6.5	6.9	86.2
College catalogs describing these programs	64.1	30.8	5.1	0.0	27.5	39.6	8.1	24.8
Booklets, leaflets and/or flyers describing these programs and the opportunities and careers open to graduates of these programs	58.4	35.1	3.9	2.6	24.8	40.8	7.4	27.0
Personal letters to interested individuals	32.5	26.0	26.0	15.6	3.5	7.7	5.8	83.0
Direct mail promotion material sent to potential students	23.7	26.3	13.2	36.8	3.9	12.4	7.2	76.6

TABLE 2 (Continued)

Media	College Use				Student Influence			
	Extensive %	Moderate %	Occasional %	Not Used %	Major %	Minor %	Undecided %	None %
Articles and news releases in local newspapers and publications promoting these programs and the employment opportunities open to these graduates	19.5	40.3	26.0	14.3	9.6	23.0	8.4	59.1
College newspaper advertising	9.3	22.7	20.0	48.0	0.3	2.7	3.9	93.2
Exhibit at county fair or other community events	1.3	13.0	35.1	50.6	2.8	6.9	3.8	86.5
Speeches about these programs	32.1	46.2	20.5	1.3	15.5	28.4	6.9	49.3
Radio announcements promoting these programs	6.4	11.5	39.7	42.3	2.6	9.9	6.3	81.1
Television announcements promoting these programs	2.6	7.7	25.6	64.1	2.2	9.9	6.7	81.1

Footnotes to "Recruiting" Techniques

1. Table 1 is compiled from several tables in Krejcie, pp. 39, 41, 43, 45, 46.

2. Table 2 is compiled from several tables in Krejcie, pp. 59, 62, 63, 65, 66.

3. See Krejcie, pp. 48, 50-52 for the estimated influence of recruiting practices from the student and faculty perspectives.

4. See Krejcie, pp. 61, 63-66 for the estimated influence of media from the student and faculty perspectives.

5. Krejcie, p. 30.

6. These conclusions are contained in Richards, pp. 180.

7. Richards, p. 207.

8. Compton College, "Recruiter Training Manual," p. 4.

9. This information comes from two June 1, 1972 memoranda from James Johnson, supervisor of the mobile van for the communication and recruitment project, to Roger Beam, Director of Occupational Education. They are sent to the author as part of a packet of materials on the project.

10. Erie County Technical Institute, p. 14.

11. Burt, p. 233.

12. Krejcie, p. 114.

13. Havelock, p. 9-4.

14. Havelock, p. 9-5.

15. Havelock, p. 9-4.

16. Havelock, p. 9-40.

17. Havelock, p. 10-37.

18. The complete set of hypotheses used in the experiment are listed in Richard's, pp. 114.

19. The complete set of conclusions is in Richards, pp. 180.

20. Compton College, "Communication and Recruitment Project, Phase I, Final Report," p. 14.

21. Compton College, above, p. 14.

22. Compton College, above, p. 10.

23. 1971 Manpower Report, p. 102.

24. Krejcie, p. 36.

25. Krejcie, p. 35.

26. Burt, p. 216.

27. Greco, p. 33-35.

28. Compton College, "Communication and Recruitment Project, Phase I, Final Report," p. 13.

29. See the Compton College "Recruiter Training Manual."

30. Krejcie, p. 31.

31. Erie County Technical Institute, p. 2, 10-12.

32. Richards, p. 207.

33. Burt, p. 212.

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APPENDIX E

INTERVENTION STRATEGIES FOR INCREASING ENROLLMENTS IN COMMUNITY COLLEGE TECHNICAL PROGRAMS

by

Dorothy Knoell

Rationale for Intervention Strategies

Intervention strategies will be needed to insure an adequate supply of technical manpower until such time as career education permeates the public schools including the community colleges. Such strategies will be necessary unless the goals of career education are achieved for a majority of young people. Intervention strategies will still be needed after career education is a reality for all, in order to assist adults in making the many changes which characterize most employment experiences. Intervention strategies would not be needed for adults (after the adoption of widespread career education) only if a continuing education program for adults who have left full-time education also becomes a reality.

Intervention strategies are based on an assumed need for a significant change in direction or focus in the educational and career development of individuals at various strategic times in their lives. Without such intervention we may assume that most individuals would continue in the same type of development as formerly, or that they might select another direction at random. Intervention strategies are thus designed to have a significant impact on the individual's development, with the result that he alters his plans or activities so as to enter the particular job specialty which the intervention is intended to affect. In their simplest form, intervention techniques may be informational in nature, designed to do little more than serve as attention-getters or distractors.

It is more likely, however, that intervention strategies will be actions producing either "rewards" or "punishment." These rewards or punishments will occur on either an immediate or deferred basis. A simple example of an immediate reward is a cash bonus to students who will change their major to the desired field. A delayed award is the promise of guaranteed employment upon completion of a program in the field under consideration. "Punishment," on the other hand, may involve the denial of opportunity for, or benefits from, alternative fields of study. (Better terms for "reward" and "punishment" may be "incentive" and "deterrent." However, in the early discussion the stronger concepts are somewhat useful in attempting to show their impact on enrollments.) Rewards and punishment as intervention devices are classified as direct and indirect. Money is the simplest example of a direct reward for enrolling in a particular program, and change in perception of self is an example of an indirect, probably delayed reward.

Questions may be raised about the propriety of various "deterrent" techniques as intervention strategies. It may be pointed out that precedent has been set by collegiate institutions which establish (1) differentiated student fees and (2) enrollment quotas for various special programs. While less desirable than incentives from a student personnel point of view, such techniques may be necessary in times of severe shortages of students and manpower in certain fields which are essential to society.

Effective intervention strategies may be planned for a number of strategic points in an individual's life-long educational and career development to change the course which he or she probably would have pursued otherwise. Strategies may be used in the early grades for young children from both impoverished families and those from parents with a college-going tradition. Interventions might not cease with the end of formal schooling but, instead, may be most effective with working people desiring or needing new career fields for any of the variety of reasons: boredom, underemployment, job obsolescence, security, and promotion.

Interventions Over Time

A variety of strategies are needed for persons of all ages in order to increase enrollments in community college technology programs to the desired level. From our knowledge of human development, it is possible to postulate a number of points in time when intervention strategies may be used most effectively to do one or more of the following:

1. Arouse interest in the technologies;
2. Motivate persons to prepare for and then enroll in technology programs in community colleges;
3. Divert persons from alternative courses of action in selecting a college major; and
4. Divert persons from other career fields, to seek specialized training in a technology.

The most important stages in the development of the individual for which intervention strategies are needed are (1) the primary grades, (2) junior high school, (3) the junior and senior years in high school, (4) the freshman year in college, (5) the young adult worker, and (6) the older adult worker.

The Primary Grades. Intervention strategies below the high school level will of necessity be informational in nature and/or provide some type of reward They may also be designed for both student and parent, as the primary influence of the educational development of the child. Both the disadvantaged child and the child from an affluent family begin to develop self-concepts and life style in the early school years which, if not contravened, will result in an avoidanc of technology programs and, probably, of community colleges generally in later years. Children from racial and ethnic minorities and other disadvantaged yout still "turn off" to college at an early age, despite intensive efforts to increase the college enrollment of the disadvantaged. Among those who are now awakening to the opportunities which higher education is prepared to offer, few turn on to the technology programs in community colleges, preferring instead the liberal arts in four-year institutions and professional fields.

The children of the affluent with a college-going tradition are scarcely more likely to consider a technology program in a community college as their collegiate destiny, unless some intervention occurs to divert them from a path leading to a four-year college or university. The intervention strategy must then produce attitude change on the part of young parents of primary school children, while creating an awareness among the children of the world of work of technologists, and of their potential to be part of that world some day.

Current curricular planning is attempting to inject new, improved concepts of the world of work into the curriculum for the primary grades, as an important first phase of career education for the youngest students. If long-term goals relating to recruitment into the technologies are to be achieved, however, there must be a parallel effort to develop new concepts and values on the part of the parents of elementary school children. These may have the dual outcomes of making parents interested in technology programs for (1) themselves when they are faced with retraining or upgrading and/or (2) their children, for whom they might have wanted professional training. The intervention strategy in this case involves a parent education program designed to change parental attitudes about what kind of careers they want for their children, and in some cases adult attitudes toward their own career and educational development over time.

Research shows that many career decisions are made during the elementary grades, when young students affirm for themselves what may have been parental decisions that their sons and daughters should become teachers, physicians, lawyers, or other professional workers. At the other end of the socioeconomic continuum, many children of the disadvantaged adopt role models in the primary grades which are the antithesis of the professions and even the technologies, in that they reach the conclusion that society has effectively erected barriers to their access to these careers. Instead, their models still tend to be found in the often unacceptable societal roles which prevail in the inner cities. Thus the intervention strategies must differ dramatically for young students and their parents from the advantaged and the disadvantaged, in order to make the technologies acceptable and then attractive to both socioeconomic groups, and to both parents and children. Parental education programs to date have had minimal success in achieving these goals, in part because of their focus on other concerns. However, the U.S. Office of Economic Opportunity and other agencies have made some strides in working with parent-child groups, by creating a climate in which attitudinal changes may occur on the part of parents and children.

The Junior High School. In New York State and elsewhere, where the poor are concentrated in major urban areas, decisions about college attendance are made at the junior high school level which have a kind of finality not easily reversed. Directive counseling is given about choice of high school program--college preparatory, vocational, or the dead-end "general"--which has tended to restrict future options for many students for all time. The junior high school may indeed be the most critical time in grades Kindergarten through 12 for intervention strategies to prevent students from "turning off" to higher education forever. Studies show that students at about the ninth grade level tend to believe and act out their counselors' judgments that they are not "college material." In doing so, in subsequent grades, they see no reason to strive for the good grades which enable other students to attend college. They may respond to the admonition to stay in school until graduation, in order to obtain employment, but the motivation to work for better-than-passing grades is lost, as is their interest in the kinds of courses which would prepare them for post-secondary education.

Strong, direct intervention in the lives of junior high school students by community college personnel appears to be necessary under present conditions, if enrollments in technical curricula are to be increased significantly.

Recruitment techniques aimed at students in general simply will not work, in that students intending to go to college will be simply "re-recruited," while those not already recruited will fail to heed the call. One might say that the poster depicting Uncle Sam saying, "I want you!" needs to be personalized in college recruitment to a far greater degree than at present, in order to convince the unrecruited that the community college is indeed for him, as well as for students from families with a college-going tradition.

Strategies to be suggested may appear to be "gimmics," but they have demonstrated value as attention-getters among junior high school students, as a necessary first step in changing their educational and occupational destinies. In essence, the strategies are designed to bring about an identification with the community college on the part of the young student who has been led to believe that college is not for him. Specific techniques may range from a tentative letter of commitment from the community college president that the ninth grade student will be admitted to college upon high school graduation, to a guarantee of financial aid if the need exists at the time of admission, with campus visitation arranged as a supportive technique.

Direct intervention with junior high school students by college personnel is recommended, while curriculum reform at the junior and senior high school levels is hoped for. Such reform is along the lines of developing new career education counseling, as well as programs at all grade levels. While the goals seem to include that of making every high school student employable immediately upon graduation, articulation with technical programs in community colleges will surely be sought as well. Occupational competency at high school graduation will necessitate changes in community college curricula to insure good articulation, once new secondary school programs are implemented. However, a first priority appears to be the use of intervention strategies with junior high school students who are not traditionally among the college bound, to make them aware of the opportunity for post-secondary education which is open to them in the community colleges for the asking.

The Senior High School. Senior high school students in New York are often "tracked" in such a way that intervention techniques designed to "turn them on" to community colleges will be only partially successful. The problem is essentially a lack of preparation for college among those whose decisions are deferred until senior high school--poor study habits and skills, inability to communicate effectively, absence of mathematical skill development, and a general attitude of inability to succeed in college. A vastly different type of intervention strategy is thus needed at the senior high school level, which involves skill development as well as attitude changes.

Strategies are first needed which will produce changes in attitude about self and the individual's future prospects in relation to post-secondary education in general and the community college in particular. As students move into the eleventh and twelfth grades, their defenses about college attendance grow still stronger and interventions to break them down are more difficult to design. Defense for non-attendance invariably include parental objections, lack of funds, lack of preparation, employment prospects, and disinterest in college generally. Peer influences are often stronger than those of parents or counselors. Such defenses are often a cover for the student's early perception of himself as an academic non-achiever and his subsequent determination to ignore possible options involving college attendance.

If self-concepts and interests can be changed in time, additional intervention strategies to remedy academic deficiencies before high school graduation are very much needed. Federally funded Upward Bound and Talent Search programs have produced certain strategies which are in a sense complementary to the City and State University of New York programs.

Still another group of senior high school students should be mentioned as possible subjects for a different kind of intervention, i.e., college-bound students planning to undertake liberal arts and preprofessional studies, who might be persuaded to change direction and to enroll in community college technology programs. Current employment problems of recent baccalaureate graduates may bring about changes in the plans of new college students in the direction of technology programs, without special interventions. However, community college officials should be alert to the need for making such changes as easy for the student as possible.

College and University. Intervention strategies may be planned for three types of college students, for use at variously appropriate points during the early college years as a means of increasing enrollments in technology programs. The first group is made up of students from various racial and ethnic minorities who have set their sights firmly on liberal arts and preprofessional programs. Technology programs in community colleges tend to be associated with the dreaded vocational programs leading to low status, blue-collar jobs for minorities. Strategies are needed which will change their perceptions of technology programs and occupations, and of their probable liking for and success in such fields.

Strategies for the non-disadvantaged in liberal arts and preprofessional programs are also needed, to help divert such students into the technologies once they have entered college. Many have no firm choice of major or career and are ready for "incentives" to enroll in a specific major. Attempts to change attitudes and perceptions may prove to be less effective with this group than strategies based on concepts of incentives and deterrents, e.g., special grants and limitation on enrollment in liberal arts majors.

The third group of college students for whom intervention strategies may be designed is the dropout from four-year colleges and universities, with either passing or poor grades. While the incidence in New York State is not known, community colleges in other states readily admit such students as part of their so-called salvage function. Even less certain is their success in counseling or otherwise enticing reentering students into two-year programs in the technologies and other career fields. However, devising strategies for increasing technology enrollments in community colleges should take this group into account. Some combination of efforts to change self-concepts and the provision of enticements or deterrents may provide suitable intervention strategies.

Adults Beyond College Age. Adults who have never been to college may prove to be one of the most significant sources of new enrollees in technical programs. The intervention may take place to change career plans and prospects to include the technologies in the case of: the undereducated, the underemployed, unemployed, veterans of military service, mid-career changers and housewives reentering formal education. Strategies may well be limited to information and the offer of supporting services at the time of enrollment, while still producing the desired outcome of increased enrollments. Still, while intervention may be relatively simple, the problem of placement of adult students in regular technology curricula may require special attention by college officials and faculty.

At the start of the discussion of possible interventions over time, attention was called to the possibility of devising strategies which would affect both the long-term career development of young children and the immediate career development of their parents who may be changing their employment status. Work at both age levels will be needed if the immediate and long-term needs of the community colleges for increased enrollments are to be met.

Taxonomy of Intervention Strategies

The strategies which have been suggested in the discussion of interventions over time may be grouped under four major headings:

1. Information giving
2. Behavioral changes in
    a. Attitudes and interests
    b. Self-concepts
    c. Capability to undertake programs
3. Incentives (or rewards)
4. Deterrents (or punishments).

Furthermore, incentives may be classified as immediate or deferred, tangible or intangible, and direct or indirect. The following are illustrations of the several types of strategies.

Information Giving:

1. Specially developed units for use in elementary and junior high school grades, as part of the new career education thrust; to include reading materials, arithmetic problems, and social studies concepts related to our technological society and the technical workers it requires.

2. Film strips, tapes, films, pamphlets, other reading material for use by high school students on an individual, self-instructional basis and in group counseling sessions.

3. Use of the local media--television, radio, and newspapers and advertisements--to give information about the need for technicians and opportunities for obtaining training. (The recent television campaign of the federal government to publicize occupational education at the post-secondary level provides a good model. The post-card responses requesting additional information were overwhelming in number.)

Behavioral Changes in Attitudes and Interests:

1. Bringing junior high school students to the community college campus on Saturdays to see the specialized technical facilities first-hand and to meet selected students and staff, eat in the college cafeteria, attend an athletic event, and otherwise "participate in" college activities.

2. Organizing "job fairs" for high school and freshman college students, at which technical occupations may be featured prominently, with college students and instructors present together

with employers of technicians.

3. Organizing "pre-technical" special interest groups for high school students, similar to the Future Teachers and Future Farmers of America.

4. Special provisions to enable and encourage community colleges to open their classes to senior high school students for college credit courses in occupational, as well as general education areas. (The Vesey Act in California offers a model for providing state and local support for such activities.)

5. Providing opportunity for visitation of community college classes in technical fields by high school students, to observe and talk with instructors and students; where residence facilities are available, arrange for high school students to spend a night or weekend at the college, assigned to a freshman "sponsor."

Changes in Self-Concepts:

1. Use role models of successful students and graduates in the technologies who are members of racial and ethnic minority groups; develop role models for use with women and adult students also.

2. "Letters of admission" to junior high school graduates from the community college president, pointing out their eligibility to enroll in the college upon high school graduation and offering career and educational counseling in the interim.

3. Administer and interpret the College Board Comparative Guidance and Placement battery (or the similar American College Testing Program tests) to identify and then recruit students with a high potential for technological studies.

Changes in Capability:

1. Upward Bound-type programs for high school students who are potential enrollees in technical programs.
2. Self-programmed refresher courses in basic college skill areas for adults who are reentering education in technical curricula, to be used in neighborhood centers and/or at business and industrial sites.
3. Placement in summer cooperative programs with business and industry, for orientation to the technical occupations and improved capability for college.

Incentives or Rewards:

1. Special grants and loans for students enrolling in technical programs, patterned after financial aid provisions for students enrolled in allied health fields.
2. Supportive services earmarked for new students enrolled in technical programs, to include tutoring, peer counseling, child care, orientation, and work-study and/or experience programs.
3. Guarantee of job placement upon completing the technical program, with salary differential for such completers (as opposed to workers upgraded on the job).
4. Offer of assistance in locating a suitable transfer institution or other type of continuing education to potential technology students who perceive such programs as "terminal" without such a guarantee.

Deterrents:

1. Establishment of limitations on enrollment in non-technical fields which are currently oversubscribed.

2. Establishment of higher tuition and/or fees for students in non-technical programs and in four-year institutions.
3. Require college students in liberal arts and transfer programs to receive career counseling as a condition of enrollment as freshmen.
4. Give career counseling to "reverse" transfer students from four-year institutions during their first term on the community college campus; encourage exploration of the technologies on the part of such students.

Implementation

It is unlikely that any single community college in the country employs all or most of the strategies suggested. However, many are offering technology and other occupational programs which are fully subscribed, while making continuing efforts to attract a larger number of minority students into such programs. A partial list of institutions with successful intervention practices is included as an Addendum.

ADDENDUM

Community Colleges with Demonstrated Ability to Attract Students to Technology Programs

California Community Colleges

Los Angeles Trade-Technical College, 400 West Washington Boulevard, Los Angeles 90015; Dr. Fred K. Brinkman, President

Laney College, 900 Fallon Street, Oakland 94606; Mr. Herbert M. Stein, President

Sacramento City College, 3835 Freeport Boulevard, Sacramento 95822; Dr. Samuel M. Kipp, President; Mr. Elbert Kennebrew, Special Assistant to the President for special projects

City College of San Francisco, 50 Phelan Avenue, San Francisco 94112; Dr. Louis F. Batmale, Superintendent; Dr. Harry Buttimer, President

The Community Colleges of San Diego, District Office at 835 Twelfth Avenue, San Diego 92101; Dr. Charles W. Patrick, Deputy Superintendent for Community Colleges; William B. Steinberg, Director of Vocational Education

Community Colleges in Other States

The Junior College District of St. Louis: The Forest Park Community College (in particular), 5600 Oakland Avenue, St. Louis, Missouri 63110; Dr. Ralph E. Lee, President

Santa Fe Junior College, Gainesville, Florida 32601; Dr. Alan J. Robertson, President

Cuyahoga Community College, Cleveland, Ohio: District Office at 2214 East 14th Street, Cleveland 44115; Dr. Charles E. Chapman, President; see also Metropolitan Campus, Dr. Donald H. Smith, President

Dallas County Junior College District: Main and Lamar Streets, Dallas, Texas 75202; Dr. Bill Priest, Chancellor; see also El Centro College, Dr. Donald T. Rippey, President

Community College of Denver: Dr. Leland B. Luchsinger, President; North Campus, Dr. John H. Swenson, Director; Red Rocks Campus, Dr. Joseph K. Bailey, Director

Washington Technical Institute, 4100 Connecticut Avenue, N.W., Washington, D.C. 20008; Dr. Cleveland L. Dennard, President

Chicago City Colleges, 180 North Michigan Avenue (Suite 1100), Chicago, Illinois 60601; Dr. Oscar E. Shabat, Chancellor; see particularly Dr. Virginia Keehan, President of Southwest College, and Mr. James Broman, Director of the Skills Centers

APPENDIX F

THE ATTRITION 'PROBLEM' IN THE COMMUNITY COLLEGE

A. Introduction

One of the frequent criticisms directed at community colleges is their inability to hold students. Although rates os student attrition vary widely among community colleges and across programs within a specific institution, there do appear to be systematic differences in the attrition rates characterizing two-year and four-year institutions of higher education. Critics argue that dropping out of college is an indicator of social injustice because it correlates with level of family income and enthnicity. From this perspective the higher attrition rates of community colleges cast doubt on their efficacy as instruments for equalizing educational opportunity beyond the high school. Other observers view dropping out in terms of efficiency rather than equity and express their concerns in terms of lost investments, ineffective use of educational resources, or manpower shortages. For these and other reasons, the attrition rates of community colleges are perceived to be both a social problem and a policy issue by many observers of post-secondary education.

Community college leaders often respond to these criticisms by denying the existence of an attrition problem and thereby the validity of the issue. They argue that their institutions are not part of the lockstep credentiallin system. Instead they contend that community colleges are analogous to educational supermarkets or smorgesbords; students enroll, take what they want, leave and return as they find the need to do so, and this is natural and good This is the stock response to external critics. However, within the communit college systems, themselves, there seems to be a growing concern about attrition and many community college faculty and administrators see it as a major problem.

This paper was commissioned to shed light on the attrition "problem" in specific programs in New York State. The programs in question are engineering-related technical programs offered in the community colleges of that state. The data required to analyze the scope and causes of attrition in these programs was not available and there was no a priori reason to believe that the dropping out phenomena in these programs differed significantly in character from its manifestation in other community college programs. Therefore, the following strategy seemed appropriate: examine the evidence on the scope, causes, and consequences of attrition in community colleges and apply this evidence to the specific case. After brief discussions of theoretical and measurement problems, this paper follows that strategy.

B. Theoretical Perspectives

There are a number of competing partial "theories" that influence the perspectives of researchers and practitioners alike on the dropout problem. These alternative explanations affect the data that is collected and the manner in which "solutions" are defined; therefore, they are critical to an understanding of our knowledge of the problem. I will label these differing but overlapping viewpoints: the cooling-out theory, the deviance theory, the unresponsive environment theory, the status maintenance theory, and the natural process theory. This list may not be comprehensive but it probably includes the major competing approaches to the explanation of student attrition.

1) The Cooling-out Theory

Perhaps the most influential research ever conducted at a community college was Burton R. Clark's The Open-Door College.[1] He labelled (some might say libeled) public two-year colleges as "cooling-out" institutions. Clark's hypothesis was that American higher education had to create an elaborate and delicate mechanism for diverting students from goals (and social rewards) to which they aspired but which a highly stratified, meritocratic society could not permit them to attain. Simply put, the educational system is the locus of a contest for social statuses and rewards and someone has to finish second, and third and so on. Hence open access is combined with a soft denial of worth or merit to alleviate the stress of failure and reduce anomic or deviant reactions by the losers. The consequences of these processes is that society can continue to encourage maximum effort from all youth without risking major disturbances arising from frustrated aspirations.

"Cooling-out" implies that certain students are deliberately and secretively discouraged from educational and occupational aspirations that most American youth take for granted. The mechanisms used by community colleges to 'cool-out' some of their clients include substitute achievement (career or occupational programs of a "terminal" character), gradual disengagement (open admissions and the opportunity to fail), objective denial (testing, grades, and the cumulative record), consolation agents (counselors) and the avoidance of standards (the use of multiple definitions of merit).[2]

The objective of the "cooling-out" process is not to remove the student from the college but to channel him into a program congruent with his "abilities and interest." Thus, the attrition "problem" might be a consequence of ineffectual "cooling-out" mechanisms. In this view, the high attrition rates are the logical consequences of an emphasis upon selection and the systematic frustration of ambitions and expectations. Attrition must be explained in terms of institutional characteristics and behaviors.

2) The Deviance Theory

A second and more popular view (particularly among educators) treats dropping out as a form of social deviance, a phenomena to be explained in terms of some inadequacy, quirk or failure on the part of the dropout himself. The problem becomes one of changing the individual student and the solutions proposed take the form of various forms of therapy or remediation. This perspective explains why most of the research on attrition emphasizes characteristics of the dropouts.

Such a viewpoint is bound to prevail in a society that stresses the responsibility of the individual and whose educational paradigms are dominated by the "science" of psychology. It also happens to provide a convenient explanation for educators as it simultaneously removes them from responsibility for the problem and provides a basis for claiming more public resources for education. Its popularity, however, is not a means of testing its validity.

Community colleges are typically open-door institutions and, in theory, take in almost all-comers. Thus they cannot select out all those whose characteristics would predict a high probability of failure. In short, deviants from conventional academic norms are permitted to enter. Therefore, from this viewpoint, it would be quite surprising if community colleges did not have higher rates of attrition than more selective institutions.

3) The Unresponsive Environment Theory

A popular argument holds that institutions of higher education are rigid, impersonal bureaucracies that exist primarily for the benefit of their functionaries and are unresponsive to their primary clients--the students. This argument is similar in some respects to the cooling-out theory except that in this case attrition is seen to be the consequence of neglect and acts of omission rather than acts of commission. Colleges fail to provide appropriate and meaningful learning experiences; faculty are distant, busy and disinterested; the large size of the colleges inhibits or limits participation in campus life and creates an impersonal climate; and the growing tendency to live at home or off-campus reduces the student's attachment to the college and therefore its ability to hold his interest.

The major issues here concern the social climate and social dynamics of the institution and their consequences for students' attitudes. Community colleges are commuter colleges and their informal campus life is more limited than that found in residential settings. Moreover, a much higher proportion of the students are employed while attending community colleges and these and other commitments reduce their attachment to the colleges and to what they offer.

4) The Status Maintenance Theory

A more radical interpretation of the dropout problem contends that it is the result of systematic and pervasive class and ethnic bias and discrimination. From this perspective, the system is operated to maintain the status quo (although the intelligent but poor are coopted) and the curricula, faculty, and standards of performance operate to the disadvantage of those who are poor, black, or female. This view has received considerable attention in recent years and it need not receive further attention here except to mention a recent re-statement of this perspective. Students drop out of community colleges, the argument goes, because they come to understand that neither the skills nor the credentials to be attained there will be of significant economic value to them and the whole experience is a sham designed to pacify their inflated expectations and, not so incidentially, keep them off the labor market.[3]

5) The Natural Process Theory

This argument is relatively simple (and perhaps trivial): students leave because they choose to and they choose to because they have other things to do--get a job, go to another college, etc. Attrition from this perspective is not the problem; the problem is an educational system that insists upon concentrated educational experiences for particular age-groups. The system should permit dropping out and re-entry as the needs and interests of individuals dictate.

The difficulty with this argument is that it ignores both the demand for and the social significance of credentials. Nearly nine out of ten community college students say that they desire an associate degree or higher. It also ignores the systemic features of the attrition process--and of course, it conveniently absolves the institution from any responsibility for the result of its activities.

The significance of these five "explanations" of the attrition process in community colleges arises from their _a priori_ nature. That is, researchers, administrators and others concerned with the dropout problem typically adhere to one of these partial theories prior to any investigation of the phenomena and their bias shapes their decisions about data collection and interpretations. Such biases seem to have obstructed a comprehensive study of the problem and, as a result, the existing research is characterized by the ommission of important variables and is subject to criticism and rejection on these grounds. The fact of the matter is that each of the 'partial theories' described above is supported by some data and seems to have captured a piece of the truth. The failure to take a broad approach that treats all these 'theories' as partial explanations and disaggregates the problem accordingly has hampered our understanding.

C. Definition and Measurement

There is no general agreement on the use or meaning of the term 'attrition.' Some use the term to describe the proportion of students who fail to attain degrees at an institution in which they enrolled. Others define it in terms of those students who fail to attain a credential from any institution in a 'reasonable' period of time. Research on attrition is often rendered non-comparable by the use of different time frames. Still others wish to define it as referring only to students who leave an institution involuntarily. A study of the future of community colleges in New York State reviewed this problem thoroughly and concluded that the broader definitions of attrition (all who leave) were not indicative of the effectiveness of the institution and that in many situations, dropping out was desirable.[4] Hence the problem had to be disaggregated and a better measure developed.

The same report recommended that:

> "The comprehensive evaluation of attrition of two-year colleges needs to be both precise in terms of numbers persisting in academic programs and diagnostic in terms of reasons for leaving so that preventive action may be initiated where possible and appropriate."[5]

The authors were highly critical of the crude measures of attrition typically used in New York. The most common calculations are made by comparing first and second year enrollments or comparing graduates to the entering class of two years previous.[6] The problems with such indicators are obvious: the most important one being their inadequacy as guides for preventive action.

The report concludes, however, that the best indicator remains the portion of the students who successfully complete the program:

> "Therefore, attrition analysis must be concerned with (1) those who fail to complete their programs at colleges of original enrollment and (2) those students who fail to complete their programs at any institution. The analysis of attrition should attempt to provide not only the facts but the causes."[7]

Astin recently completed a national study of attrition at different types of institutions for the American Council on Education.[8] The study examined the experience of the freshmen class of 1966 over a four-year period. Astin used four measures of retention:

1) students returned for at least a second undergraduate year

2) received a degree

3) received a degree or was still enrolled for degree-credit in Fall 1970.

4) received a degree, still enrolled for degree-credit in Fall 1970 or had transcripts sent to another institution.[9]

The first measure is merely a persistence measure and not an index of dropout status since it does not relate directly to program completion. The second measure provides overestimates of the problem as it ignores transfers and persisters. The third and fourth measures narrow the definition considerably. The fourth one probably is too generous since not all students who have transcripts sent to another institution will subsequently enroll in it or, if they do, receive a degree from it.

The measures used in the ACE study indicate the range of measures in use although few of the studies conducted at the institutional level use any variation of the fourth measure described above. Hence there is a built-in tendency to overestimate the problem. Moreover, the less strict measures may be even less appropriate for community colleges with their varied clientele and transitional role than they are for four-year schools. Certainly comparisons of these two types of institutions on the basis of such indicators are an inadequate criterion for judging the relative effectiveness of their programs.

D. The Scope of the Problem

Data on attrition is fragmented and generalizations must be made with some caution. With a few notable exceptions, the research has not been characterized by careful design and rigorous data collection. There are two simple explanations for this: few institutions really want to know how badly they are doing and research on attrition using strict measures and careful methods is expensive and time-consuming. The most frequently cited research of this type has been undertaken by university researchers and they seem to delight in revealing the apparent ineffectiveness of community colleges.

Critics of community colleges emphasize data such as that in Table 1 below. The sources of such data are often difficult to trace and in many cases turn out to be 'educated guesses' or to be based upon case studies that may or may not be prototypical.

Critics of community colleges also frequently point to the fact that less than 14% of all students entering California's system of public higher education receive bachelor's degrees.[11] Since this is much lower than the national mean (California ranks 49th) and California relies heavily upon community colleges, the obvious conclusion is drawn. These harsh conclusions about the

Table 1

Persistence Rates in Different Types of Institutions of Higher Education[10]

Type of Institution	Percent Graduating within 4 years of initial institution	Percent Graduating within 10 years of any institution
Fifteen most selective private institutions	80-85	90-95
Large state universities	35-45	60-70
Large state colleges	15-25	35-50
Public junior colleges	20-25	15-30

effectiveness (or intent) of community college programs receive some support from national data which shows that sophomore enrollments in community colleges are consistently less than 50% of the previous year's freshman class.[12] Whether or not this constitutes a problem, of course, depends upon one's view of the purposes of community colleges and upon the reasons why the students left.

Several recent studies have found attrition rates to be somewhat lower than reported above. Table 2 presents data from the recent ACE study that reveal quite a different picture.[13] Based on a national sample of institutions, and weighted to ensure representativeness, the data show community colleges to be only somewhat less successful at holding students than four-year schools. The 65% figure for persistence in community colleges using the strictest measure undoubtedly overestimates the rate of degree completion.

Another study based upon a relatively small sample taken in the Current Population Survey conducted by the Bureau of the Census found that only 36% of two-year college students completed their programs within three years and that an additional 10-15% were still enrolled in their institutions of first entry.[14] While these figures exceed the pessimistic estimates of Table 1, they are not as generous as the ACE data.

Three further points about this data on persistence. When Astin controlled for the characteristics of entering students, the differences in attrition rates between two and four-year colleges were further reduced. And when he calculated expected rates of attrition based on student characteristics, community colleges fell only slightly short of the predicted rate.[15] Second, there is enormous variation in attrition rates among community colleges.[16] This may reflect differences in clientele, climate, programs, or proximity to public four-year schools. Third, the data on attrition means little unless it is juxtaposed to data on student aspirations. Nearly 90% of entering community college freshmen report that they aspire to attain at least an associate degree and over three-quarters hope to obtain a bachelor's.[17] An important question for research is why these aspirations are put aside? Equally important is to understand the consequences for those who find their expectations frustrated.

Table 2

National Persistence Rates for
College Students by Sex

Percent of Students Who:	Two-Year Colleges			Four Year Colleges and Universities		
	Men	Women	All	Men	Women	All
Returned for a second year	67.0	64.5	66.0	78.7	77.1	78.0
Received a degree	36.6	41.2	38.4	45.2	48.6	46.7
Received a degree or still enrolled	38.9	42.8	40.5	60.7	55.6	58.5
Received a degree, still enrolled, or requested transcript sent to another institution	65.5	66.5	65.9	83.5	78.3	81.2

The only data available on attrition rates in engineering-related technica programs in public community colleges of New York State come from some rather inadequate institutional studies. These data show attrition rates ranging from 40 to 65%. These studies probably overestimate the problem as they give inadequate attention to the follow-up of dropouts and therefore do not allow for individuals completing degrees elsewhere. Community college administrators seem to agree that engineering tech programs have higher attrition rates than other career programs, but the rates do not seem out of line with the national data. Moreover, there are some special factors at work in the engineering tech programs. These will be explored in the next section.

E. Correlates and Causes of Attrition

The more comprehensive studies of attrition use complex statistical proced to identify "causes" of the problem. It must be remembered that statistics dea with correlations, not causes, and that only a priori assumptions about the nat and direction of these relationships permits the researcher to make causal infe ences. Most researchers assume that their design includes all the key variable few seek to explain relationships by reference to intervening variables. Knowledge of the variables that predict a dependent variable does not necessarily enhance our understanding of the causal mechanisms operating to produce the phenomena being studied. For example, Astin found that smoking cigarettes was one of the factors related to attrition in community colleges.[18] We need to understand the contingencies or intervening variables that account for the relationship. Further, given the typically small proportions of the variance in attrition explained by the independent variables, it seems rather presumptuous to speak of "causes."

Frequently the research fails to distinguish between variables subject to manipulation by policy-makers and parameters or conditions that must be taken as given. The racial and socio-economic characteristics of students are givens unless the college or program wanted to alter its recruitment processes. Academic ability and preparation of students are givens in the short-run, although the college could impact upon the high school program, alter its admissions criteria for specific programs or expand remedial programs. Motivation, self-image, financial conditions and program characteristics may be subject to change by policy. The critical need is to focus on variables subject to treatment, although the parameters or givens must be understood as they affect the success of the treatment.

Table 3 displays the results of three major studies of attrition in terms of the importance assigned to specific independent variables. Two of the studies (Astin, 1972, and Jaffe and Adams, 1970) were based on national samples; the third study (NORCAL) was based on twenty-two community colleges in California. There are clear areas of consensus in the three studies. Socio-economic origins of students do not seem to be significant; whereas academic experience, sex and motivation are important predictors of attrition. There is only one area of disagreement in the three studies and that is the effect of academic ability. These conclusions suggest greater clarity about the problem of attrition than is warranted. To understand the difficulty here, it is necessary to take a closer look at some of the important independent variables, their impact on attrition rates and their significance for engineering-related technical programs.

F. Race

Astin found that the higher dropout rates among blacks were substantially reduced when he controlled for scores on aptitude tests and high school grade point average (GPA).[22] The NORCAL project identified race to be one of the five most salient variables in predicting attrition but did not report its independent effect when academic factors were controlled. In developing a simplified prediction model, however, the NORCAL staff dropped the race factor and used an index based solely upon sex and ability.[23] Race turns out to be an important parameter but not a critical consideration in designing attrition reduction programs.

Enrollment and attrition data for New York State's community colleges broken down by race and program were not available so the effect of the race factor on these programs could not be assessed. The overall impression attained was one of all-white faculties and predominantly white student bodies in these programs.

Table 3

Major Studies of Attrition and the Identification of Key Independent Variables

	Astin[19] (1972)	NORCAL[20] (1971)	Jaffe & Adams[21] (1970)
SES of student's family	Not included	Not highly significant	Not highly significant
Race	Significant	Significant	Not included
Sex	Highly significant	Highly significant	Not included
Academic ability	Highly significant	Highly significant	Not significant
Academic experience	Highly significant	Highly significant	Highly significant
Financial variables	Significant	Significant	Significant
Motivation and aspirations	Highly significant	Highly significant	Not included
Institutional factors	Not included	Inadequate	Not included

G. Sex

Both the Astin study and the NORCAL project found sex to be important. However, Astin discovered that female sex had a negative weight on persistence when ability was controlled and NORCAL found that dropouts were most likely to be male. These results are not necessarily contradictory as they reflect different designs. There might be systematic differences in ability between men and women in California community colleges. However, the results do not clarify the policy puzzle. If both studies are correct, equity would demand assigning higher priority to the recruitment of women rather than the reduction of attrition among males, e.g., equalizing the access for men and women of similar ability.

Engineering tech programs do not recruit women. Other things being equal, the NORCAL findings would predict higher attrition rates in predominantly male programs. The influence of maleness may reflect the pressure to seek employment, opportunities for employment, or lower academic ability among male students in community colleges.

H. Academic Ability and Experience

These two categories will be treated together because measures of ability and achievement are confounded and only analytically independent. That is, tests of ability are also measures of achievement and grades reflect ability. A 1967 review of sixteen institutional studies of attrition concluded that academic ability was of no value in predicting dropouts.[24] The major studies reviewed here suggest the quite opposite conclusion. Astin found that high school GPA and academic aptitude tests were the best predictors of attrition. Students in the high quartile on both dimensions were four times as likely to persist as those in the low quartiles.[25] NORCAL found that an index of sex and ability predicted over 70% of all drop-outs.[26]

Jaffe and Adams found that measures of academic ability and grades predicted continuation at four-year schools but not at two-year schools. This may be a spurious result of the small sample size involved in their study, but it does raise some questions about the dynamics of attrition at two-year colleges. Equally of interest was their finding that high school curriculum was of overriding significance (compared to seven other academic and social variables) for college entrance, type of college entered and attrition. It was the only variable strongly related to two-year college attrition. Vocational and non-college prep students were three to four times as likely to drop out as college prep students. Curriculum choice in the high school reflects underlying personality attributes and predispositions quite apart from income, class, race and ability, and these factors are not overcome by the community college milieu.[27] The conclusion is supported by more recent evidence from CUNY.[28] These findings suggest that the nature of the educational experience and preparation prior to entry may be more important than ability per se. The Astin and NORCAL studies did not include attention to these variables (except for GPA) and so neither confirm nor deny this conclusion. The research on self-image, motivation, etc., treated below also supports this viewpoint.

Engineering-related programs in community colleges appeal to the vocationally oriented students but they demand heavy doses of math and science. The students with the interest often lack the preparation due to a lack of sound advice while in high school. Moreover, the programs are more time-con suming and require more energy than other programs. In the face of these factors, it would be surprising if the programs did not have higher attrition rates than other curricula.

I. Financial Variables

All three of the studies reviewed here found financial factors to be important influences on attrition rates but of lesser significance than the academic and sexual variables. Need for financial aid and employment during the school year were both negatively related to persistence in school. Astin found employment to be the second best predictor of dropouts in two-year colleges.[29] This raises some questions about the current emphasis upon work/study programs and the lack of financial aid in free-access (low tuition) institutions. Since a high proportion (half to three-quarters) of full-time community college students work during the school year, this evidence demands further investigation.

The data also support the hypothesis that much of the attrition results from opportunities for students to attain jobs. In areas where the credential is not important, students may choose to leave after attaining saleable skills. Attrition in such programs may be more a function of changes in the labor market than aspects of the program or college. This clearly could be the case in engineering-related programs whose students tend to hold vocational goals and not to place a high value on college per se.

J. Motivation, Self-Image, Aspirations and other Psychological Variables

The NORCAL project found specificity of goals for college, amount of parental encouragement, and importance of college to self to be among the five best predictors of attrition. Simply put, the potential dropout held vague goals for college, received little support from parents, and was uncertain about the personal significance of college.[30] Astin also found that degree aspirations were related to persistence.[31] A recent review of two major longitudinal studies of educational and status attainment processes concluded that college attendance among youth may hinge more upon psychological support from parents than upon economic assistance.[32] Moreover, the status aspirations of youth and their crystallization seem to exercise a primary influence on subsequent educational and occupational attainments.

A similar argument has been put forth by Patricia Cross in her recent book on the 'new students' in post-secondary education. She challenges the conventional wisdom that the most important attributes of these new clients are their low socio-economic status, sex, or ethnicity and argues instead that their past experiences of frustration and failure in the public schools are the key to understanding their needs.[33] She points out that the attrition process in the public schools has the effect of moving an average eighth grade student to the bottom of the achievement distribution by his or her senior year in high school. Students who suffer through this experience require something more than an open door if they are to persist in college.

No data on the degree aspirations or motivation of the students enrolled in engineering tech programs was uncovered. Aggregate data on New York community college students show they hold lower degree aspirations and are more vocationally oriented than is true of community college students nationally.[34] Yet it is not possible to make inferences from this data to engineering tech programs. Less rigorous evidence suggests that the number of transfers from these programs is growing and is likely to continue to grow with the removal of some obstacles to transfer of credits and with the development of Bachelor's of Engineering Technology programs at Rochester Institute of Technology and one or more SUNY campuses. This may bring a change in clientele and lower attrition rates.

K. Institutional Factors

Other than making a distinction between two-year and four-year colleges, the studies reviewed here treated only those institutional variables that were aggregations of student characteristics, e.g., number of blacks, students desiring to transfer, etc. Faculty and program characteristics, the availability of counseling, the climate of the campus, the existence of special programs, financial aid procedures, and other important organizational variables were not included in the designs. The college environment and program characteristics vary considerably among community colleges and yet little is known about the influence of these differences on attrition.

Dropping out can be seen as a symptom that signifies a mismatch between certain individuals and the typical community college environment. Most efforts to study the problem or to alleviate it have assumed that the individuals should be changed in order to be better able to adjust to the college. There is an alternative. Patricia Cross and others have called for an approach that considers changing the college environment as well as helping the potential dropouts adjust.[35]

Engineering technical programs may have unique characteristics that contribute to attrition. The faculty are almost entirely white males and seem to be prototypical representatives of the 'silent majority'. Simply put, they are very straight and somewhat uptight about the contemporary youth culture. This could have some impact upon students. Moreover, the faculty and the programs seem to be unaffected by the ideals of contemporary students. They still are oriented to industry and highway building in a period when the values of private industry are being challenged and ecological problems are of primary concern. There may also be differences in teaching style, counseling, grading or other program facets that could bear upon attrition. No studies have been undertaken of the 'culture' of such a program. It could be quite revealing.

L. Consequences of Attrition

Dropping out is assumed by many educators to constitute a serious social problem. They argue that dropouts are at a relative disadvantage in the labor market and therefore that resources should be devoted to raising persistence rates. Since this serves the self-interests of educators, such arguments might be expected. Dropping out certainly poses a problem for educational policy-makers and practitioners since it challenges the effectiveness and the value of their services. Of greater importance are the consequences for the drop out, does he or she stand to lose social benefits because of the decision to leave college?

The answer is that we don't know. Aggregate data on educational attainment do not distinguish between community college graduates and college dropouts, all are lumped in the 1-3 years of college category. Macro-research on the value of college degrees has therefore been unable to address the question of the economic or social significance of associate degrees. They are an unknown quantity.

There have been few carefully conducted longitudinal follow-up studies of community college graduates (none with a sample that permitted generalizations) and apparently no such studies of community college dropouts. Since the skills needed for desired employment might be acquired in less than two years and since many students apparently drop out to transfer, it is difficult to even estimate the effects of attrition. Dropping out may reflect changes in the labor market more than inadequacy of college programs or dissatisfaction among students. The important point is that we do not know and this ignorance should not be sanctified by pious rhetoric about community colleges being educational supermarkets. The data gap should be overcome so that we can answer some important questions about the economic value of the associate credential, the relevance of community college curricula, and the consequences of dropping out.

Uncertainty about the value of the associate degree may in fact be a contributory factor to the attrition among community college students. While the bachelors is a necessity for first employment in many fields, it is not clear that this is so for associate degrees. Jobs open to those with the associate degree may also be attainable by on-the-job training and upgrading. If this is so, then the costs of attaining the degree may far outweigh the benefits. If the skills are saleable but the credential is not essential, we need a different standard for judging the performance of community colleges.

The sparse literature on community college dropouts does suggest that most of them find little relationship between the employment they attain and their education experience. The NORCAL study found that only 23% of the dropouts of twenty-two Californian community colleges reported their education was directly related to their jobs. An additional 29% reported it was helpful.[36] This is not sufficient basis for judgment but such findings raise serious questions about institution-based career training.

M. Remedies

The ERIC collection contains a vast and growing literature on programs and techniques to reduce attrition in community colleges. Most of the efforts described in this literature report success and seem convinced that their approach represents the solution. Yet the problem persists in the face of this knowledge. What accounts for this apparent paradox of abundant knowledge about techniques as a persistent problem?

The answer is not clear. Some argue that it reflects a lack of commitment, that community colleges have a callous lack of interest in those who fail and those who leave. Some feel that the critical factor is a lack of resources. Certainly money for counseling, remediation, financial aid, and outreach programs is in short supply. Still others demand more R & D and call for systematic experimentation and dissemination programs.

Having examined the literature on remedial courses, special counseling, tutoring, block curricula, college readiness programs, and community outreach, it is this observer's opinion that it may not matter what is done as long as something is done. Instead of searching for generalizable solutions to the attrition problem, we must recognize that the most powerful factor we in education can bring to bear are the so-called 'Hawthorne effects.' That is, anything we do which makes a group of students feel that they are the objects of attention, concern, and consideration and that their interests are being considered will have positive impacts on their achievement and persistence. This is not meant to downplay the importance of curriculum development, financial assistance, or other responses to dropping out but only to emphasize that the success of any response depends upon its ability to convince students that someone is taking them seriously.

There are some contingencies. What is done must lift rather than depress the self-images of the clients. And it must reflect reality and not promise what cannot be delivered. The important point is that the college must be responsive and be aggressively active in its relationship to its students.

The NORCAL project studied eleven experimental programs using widely varying methods and they all had positive influence on persistence rates. This led the major investigator to reach the same conclusion reached here: responsiveness is the key. Community colleges must help the student identify with the college, the program, and his peers. It must create a community on the campus that can hold the student's attention against the distractions of our society. This may or may not require more resources; it certainly requires more effort.

Given our lack of knowledge about the consequences of dropping out, it would seem foolish to devote sizeable resources to dropout prevention. It may cost far more to keep students in school than it is worth to the individual or the community. As programs penetrate into the lower achievement quartile and into hardcore poverty groups, the costs of dropout prevention increase dramatically. It is clear that keeping these students in college is not the only way to assist them and it may not be the most effective way. We need to ask why we wish to prevent dropouts and this question calls for the clarification of social ends. This may reveal alternative means of serving these clients.

FOOTNOTES

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3 See Warner Friedman and Rue Wallace, "The Master Plan: Welcome to the Factory." Junior College Research Review (ERIC) V, No. 9, (May 1971) pp. 14-15.

4 Peat, Marwick & Mitchell & Co., The Future of the Public Two-Year Colleges in New York State. September 1969.

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6 Ibid.

7 Ibid., p. 41.

8 College Dropouts: A National Profile. Washington, D. C., American Council on Education, 1972.

9 Ibid., p. 4.

10 This table was taken from the "Newman Report". See Report on Higher Education (Washington, D. C., USGPO, 1971), p. 2.

11 W. Lee Hansen and Burton A. Weisbrod, Benefits, Costs and Finance of Public Higher Education. Chicago: Markham Publishing Co., 1969, p. 30.

12 See the enrollment data in the Community and Junior College Directories published annually by The American Association of Community and Junior Colleges.

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14 A. J. Jaffe and Walter Adams, "Academic and Socio-economic Factors Related to Entrance and Retention at Two- and Four-Year Colleges in the Late 1960's." New York, Bureau of Applied Social Research, Columbia University, 1970, mimeo.

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20 Donald L. Kester, The Lesson From the Three-Year NORCAL Attrition Study: Many of the Potential Drop-outs Can Be Helped. Final Report, July 1971 mimeo. pp. 1-15.

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25 Op. cit., p. 36.

26 Op. cit., pp. 12-13.

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28 New York Times. November 18, 1971, p. 26.

29 Op. cit., p. 37.

30 Op. cit., pp. 8-9.

31 Op. cit., pp. 38-39.

32 Archibald O. Haller and A. Portes, "Status Attainment Processes." Sociology of Education, 46, No. 1 (Winter 1973) p. 88.

33 Beyond the Open Door. San Francisco: Jossey-Bass, 1971.

34 SEE William Morsch, State Community College Systems: Their Role and Operation in Seven States. N.Y.: Praeger, 1971, Chapter 7.

35 Op. cit.

36 Op. cit.

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